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BUREAU OF BIOLOGICAL SURVEY

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REVISION OF THE MICE OF THE AMERICAN GENUS PEROMYSCUS

BY

WILFRED H. OSGOOD
ASSISTANT, BIOLOGICAL SURVEY

Prepared under the direction of
C. HART MERRIAM
CHIEF OF BIOLOGICAL SURVEY

WASHINGTON
GOVERNMENT PRINTING OFFICE
1909

LETTER OF TRANSMITTAL.

U. S. Department of Agriculture,
Biological Survey,
Washington, D. C., July 16, 1908.

Sir: I have the honor to transmit for publication as North American Fauna No. 28 a revision of the mice of the American genus *Peromyscus*, by Wilfred H. Osgood. The work consists of a systematic study of all the members of the genus, and includes keys for the identification of the various forms, together with the necessary illustrations, and maps showing the geographic distribution of the species.

The mice of this group occur in great abundance throughout the United States, particularly in the Western States, but up to the present time the interrelations and ranges of the various forms have not been worked out. Lack of this knowledge has been a source of embarrassment to workers in many parts of the country, particularly to the Biological Survey in its investigations of the geographic distribution and economic relations of American mammals. It is important, therefore, that a revision of the group be made available for general use.

Respectfully,

C. Hart Merriam,
Chief, Biological Survey.

Hon. James Wilson,
Secretary of Agriculture.

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No. 28. NORTH AMERICAN FAUNA. April, 1909.

A REVISION OF THE MICE OF THE AMERICAN GENUS PEROMYSCUS.

By Wilfred H. Osgood.

INTRODUCTION.

The American rodent genus *Peromyscus*, including the so-called wood mice, deer mice, vesper mice, or white-footed mice, has needed revision for many years. One or more of its numerous species and subspecies inhabit almost every part of North America; moreover, these mice, wherever found, are among the most abundant of small mammals. The group, therefore, is of such importance that it must be dealt with in every work on North American mammals, whether pertaining to classification, geographic distribution, or economic relations.

Although the amount of material examined for the present work is very large and the opportunities for study have been exceptional, not all the conclusions can be claimed to be final. However, the material in most cases has amply sufficed to demonstrate purely zoological problems; the chief difficulty has been to bring within the sharply defined limits of nomenclature and classification natural objects which are not sharply limited. In the study of such a large and widely ranging genus nearly all the moot points of modern systematic zoology are encountered. Most of these have been treated conservatively. Misidentifications, even of decidedly distinct species, hitherto have been the rule rather than the exception. Therefore, very fine discrimination at this time would not conduce to a general understanding of the group, but would tend rather to confusion. The reviser's own idea of the term "conservative" is of course subject to the interpretation of other workers. Describers of slight local or intermediate forms, who find many of their names in synonymy, will doubtless consider the treatment too conservative, while others, noting the long array of subspecies admitted, may think it too radical.

Important but not strictly taxonomic problems have appeared in almost every group; but most of these, however interesting, have been regarded as beyond the scope of the work. They relate especially to details of distribution, variation, evolution, and various questions which can best be treated by special workers with ample time, special data, and limited general obligations. Students of local faunas will find in these problems opportunities for extremely interesting and valuable work

MATERIAL.

In 1891, Dr. J. A. Allen, after discussing certain species of *Peromyscus*, made the following statement:[a]

> But the time has not yet come for a satisfactory revision of the group, to attempt which at least 20,000 specimens are requisite, collected so as to fully represent the seasonal phases of pelage obtaining at hundreds of more or less widely separated localities.

These conditions are now realized to the fullest degree, for the number of specimens examined in the present revision exceeds 27,000. The majority of these are contained in the extensive collection of the Biological Survey, which, under the direction of Dr. C. Hart Merriam, has been built up with special reference to the various life areas of North America, and without which no satisfactory study of this group would now be possible.[b] In addition, all the material in the more important public and private collections of America has been examined, and also important specimens belonging to European institutions, especially the British Museum. This material includes all the types, both of valid forms and of synonyms, known to be in existence. In almost all cases in which no types exist, good series of topotypes, or specimens from near the type localities, have been available. The American collections which have been thoroughly examined are distributed as follows: Biological Survey (including the collection of C. Hart Merriam, on deposit); U. S. National Museum; American Museum of Natural History, New York; Field Museum of Natural History, Chicago; Museum of Comparative Zoology, Cambridge (now including the collection of E. A. and O. Bangs); and the Academy of Natural Sciences, Philadelphia (now including the collection of S. N. Rhoads). The individuals having charge of these collections have generously allowed the unrestricted use of their material. Special acknowledgments are due Dr. J. A. Allen, of New York; Mr. Outram Bangs, of Boston; Dr. F. W. True, Mr. Gerrit S. Miller, jr., and Dr. M. W. Lyon, jr., of Washington; Mr. Witmer Stone, of Philadelphia: and Drs. D. G. Elliot and S. E.

---

[a] Bull. Am. Mus. Nat. Hist., III, p. 307, 1891.

[b] Unless otherwise stated, specimens mentioned by number in the body of this report are in the Biological Survey Collection.

Meek, of Chicago. It is also proper to acknowledge the assistance of various members of the staff of the Biological Survey who have aided greatly by their knowledge of local conditions, especially Vernon Bailey, E. W. Nelson, E. A. Goldman, and E. A. Preble. Occasional specimens from small institutions or private collectors in various parts of the country have been examined, and mention of these has been made in the systematic part of the work.

HISTORY AND NOMENCLATURE.

Early authors, noticing only its superficial resemblance to the European wood mouse (*Mus sylvaticus*), placed the deer mouse of Eastern North America in the genus *Mus*, and for some years nearly all American murines were included in that genus. In 1839, Waterhouse[a] drew attention to the dental characters that distinguish American cricetines from the genus *Mus*, and, chiefly on the basis of studies of South American forms, proposed the name *Hesperomys* to include all American rodents having a biserial arrangement of the molar tubercles. This name, although proposed in an irregular way (being antedated by its own subgenera), immediately became current and besides being used for various South American rodents, was pressed into service for the North American cricetines. It then comprised a large number of subgenera, most of which are now recognized as genera, as *Oryzomys*, *Onychomys*, *Eligmodontia*, *Oxmycterus*, *Phyllotis*, and others, and was used as late as 1891, when Allen[b] argued that, since it could not be restricted to any particular type, its use should be discontinued. Meanwhile some authors (as Audubon and Bachman 1851–1854) failed to recognize the distinctions of Waterhouse, and continued to use the generic name *Mus*. Previous to Allen, however, Jordan[c] had displaced *Hesperomys* and adopted *Calomys*, apparently assuming (not unreasonably) that *Mus bimaculatus*, which formed the chief basis of Waterhouse's characterization of *Hesperomys*, was its type, and that this species being also the type of the earlier *Calomys*, would make the two names absolutely identical in application, thus forcing the use of *Calomys* because of its priority. This action of Jordan was quite in conformity with a statement of the case made by Coues in 1877.[d] But Coues, although his own statement showed *Hesperomys* invalid, still retained it, apparently on the ground that it was "firmly established, and as the prior name *Calomys* is by the same author." However, he confined its use "in its strictest subgeneric sense" to South American forms, and for the reception of the North American forms adopted the subgeneric name *Vesperimus* previously proposed by him with the *Mus leucopus* of authors as type. When, therefore, in 1891, Allen discarded *Hesperomys* entirely, he adopted Coues's *Vesperimus* for the northern group of cricetines. The currency of *Vesperimus* was brief, for in 1892, Merriam[a] showed it to be antedated by *Sitomys* Fitzinger, 1867. This was thereupon adopted and used until 1894, when Thomas[b] discovered a still earlier claimant, *Peromyscus* Gloger, 1841. This name has remained unchallenged for nearly fifteen years, and it is to be hoped will never be supplanted.

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[a] Zool. Voy. *Beagle*, p. 75, 1839.

[b] Bull Am. Mus. Nat. Hist., III. pp. 291–294, June, 1891.

[c] Manual of Vertebrates, 5th ed., p. 321, 1888.

[d] Monogr. N. Am. Rodent., pp. 43–44, 1877.

In the first pretentious work on the mammals of North America, that of Audubon and Bachman (1851–1854), only 3 species of those now recognized as belonging to *Peromyscus* were included, namely, *aureolus*, *leucopus*, and *michiganensis* (=*bairdi*). Previous to 1854, however, several forms unrecognized by Audubon and Bachman had been described. These were *noveboracensis* (1829), *nuttalli* (1832), *maniculatus* (1845), *californicus* (1848), *gossypinus* (1853), *sonoriensis* (1853), and *texanus* (1853). In 1857 Baird's Mammals of North America appeared[c] and added greatly to the knowledge of the group. With an acuteness which is the more noteworthy when the scanty and imperfect nature of his material is considered, Baird sensed the distinctness of a number of forms not previously thought worthy, and also gave names to several new ones. Moreover, he reviewed the related South American forms and presented the relationships of the species and minor groups then known much more satisfactorily than any previous writer. Thirteen forms were recognized by Baird under the following names: *leucopus*, *texanus*, *gossypinus*, *gambelii*, *austerus*, *nuttalli*, *cognatus*, *boylii*, *myoides*, *sonoriensis*, *michiganensis*, *californicus*, and *eremicus*. Twelve of these are still recognized, *cognatus* being the only one that did not represent at least a valid subspecific form. Under *Hesperomys*, Baird also placed *Onychomys leucogaster* and *Oryzomys palustris* with the rank of separate subgenera. After Baird, followed a period of comparative inactivity in which very few new forms were described, and the concept of the group remained nearly unchanged. Then came the mistaken ultraconservatism of Coues, who, in 1877,[d] 'lumped' several of Baird's forms and also synonymized the majority of all names previously proposed for species of *Peromyscus*. Thus under *Hesperomys leucopus* were placed no fewer than 13 names, none of which are now referred to the synonymy of that species. In addition to *Hesperomys leucopus*, however, Coues recognized the following: *Hesperomys leucopus gossypinus*, *H. l. sonoriensis*, *H. l. eremicus*, *H. aureolus*, *H. michiganensis* (= *bairdi*), *H. californicus*, *H. aztecus*, and *H. melanophrys*. Like Baird, he included *Onychomys* and *Oryzomys* under *Hesperomys* as subgenera. The conclusions of Coues were not seriously challenged for several years, but after 1885 collections began to increase, and from that time until the present many descriptions of new or supposed new forms have been published, and conceptions of the number and relationships of the species within the genus have rapidly changed. Various groups which had long been included as subgenera were eliminated and given independent rank, as *Onychomys*, *Oryzomys*, *Tylomys*, *Rhipidomys*, and various South American groups, until with the removal of *Thomasomys* in 1898 the genus *Peromyscus* became restricted to forms confined to North and Central America. However, scarcely any of this recent work on the genus was of a revisionary nature, or if so it was confined to the limits of some small section. Certain papers of special importance, however, are worthy of mention. In 1890 Mearns published a brief but important synopsis of a number of the short-tailed western forms now included in the *maniculatus* group.[a] Another valuable contribution was made in 1893, when Allen,[b] in reporting upon some large collections from Lower California, gave an extended discussion of the species of *Peromyscus* concerned. The species inhabiting Florida and all the forms of *P. gossypinus* have been quite thoroughly treated by Bangs.[c] Two extensive papers were also published describing new forms from Mexico and Central America, one by Merriam[d] containing 20 descriptions, the other by Osgood[e] containing 30. Short papers and mere descriptions have been numerous. In fact, no fewer than 167 names for new or supposed new forms of *Peromyscus* have been proposed since 1885. Add to this the 14 contained in the present paper, and the total of 181 is reached.[f]

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[a] Proc. Biol. Soc. Wash., VII, p. 27, footnote, April, 1892.

[b] Ann. & Mag. Nat. Hist., Lond., ser. 6, XIV, p. 364, footnote, November, 1894.

[c] Pac. R. R. Reports, VII, pp. 1–757, 1857.

[d] Monogr. N. Am. Rodentia, pp. 43–105, 1877.

The characters of the species and subspecies of *Peromyscus* are so subtle that even from the same material different persons may form different conclusions. For this reason, and also on account of the lack of even tentative revisionary work, the production of synonyms in this genus has been unusually large. Of the 167 names for supposed new forms of *Peromyscus* proposed since 1885, 58, practically one-third, are of more than doubtful status and are here treated as synonyms. The descriptions of these supposed new species are often misleading, since it has been usual to compare them with remote and entirely irrelevant forms, while their near relatives were ignored. Much time has been wasted in elaborate descriptions of shades of color common to nearly every species in the genus, while mention of relationships and differential characters has often been omitted. As a result, original descriptions have proved of little value to the reviser, and for determining the applicability of names he has been compelled to depend largely upon type specimens.

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[a] Bull. Am. Mus. Nat. Hist. II, pp. 284–287, Feb. 21, 1890.

[b] Supra cit., V. pp. 185–197, Aug. 18, 1893.

[c] Proc. Bost. Soc. Nat. Hist., XXVIII, pp. 193–203. March, 1898, and Proc. Biol. Soc. Wash., X, pp. 119–125, Nov. 5, 1896.

[d] Proc. Biol. Soc. Wash., XII, pp. 115–125, Apr. 30, 1898.

[e] Proc. Biol. Soc. Wash., XVII, pp. 55–77, Mar. 21, 1904.

[f] The authorship of these is divided as follows: Allen, 26; Allen and Chapman, 4; Bailey, 3; Bangs, 16; Chapman, 3; Copeland and Church, 1; Elliot, 15; Mearns, 13; Merriam, 28; Miller, 4; Osgood, 47; Rhoads, 11; Shufeldt, 1; Thomas, 8.

VARIATION.

Variation in *Peromyscus* might well form the subject of extended discussion, but here it can be treated only in a general way, space forbidding the numerous tabulations which detailed study would require. Fortuitous individual variation is perhaps no greater than in most other genera of small rodents, but the range of seasonal, polychromatic, and local or geographic variation, is rather wide, so the genus may fairly be said to be more than usually variable. Individual variation is greatest in specimens from localities lying just between the ranges of two well-established forms. In fact, the complete range of difference between two extremes often may be found in series from such localities. In other cases, though obviously intermediate, certain series show variations approaching either or both extremes. Also, variable intermediates may sometimes show tendencies not apparent in either extreme but too unstable to be of subspecific importance. On the other hand, some intermediate series are quite uniform, but this is exceptional. Series typical of well-established forms show comparatively little variation except in size, and this is not often great. In order to ascertain the normal variation in size it is necessary to select carefully for illustration specimens that are unquestionably adult and that have been measured by one person, thus eliminating the personal equation. Below are given measurements of an entire series of *P. s. prevostensis*. These specimens were taken in two nights' trapping at one place and carefully measured in the flesh by myself. Every one is fully adult. From the table it appears that the mean total length is almost exactly halfway between the extremes, and that the passage from one extreme to the other is very gradual, indicating that the mean is not misleading, as it often is when a preponderance of specimens is toward either of the extremes. In total length the greatest variation from the mean is the extreme of 230 mm., which is 14 mm., or about 6½ per cent, in excess of the mean. Without detailing further evidence, it may be stated that this is about the normal percentage of variation in size throughout the genus. The same range of variation appears in both sexes—additional evidence that the average is reliable. Sexual variation, as appears below, is so slight as to be practically wanting. This seems to hold throughout the genus, for though in a given series the maximum size is usually found among the females, the separate averages of adult males and females are always approximately the same.

Measurements of 45 topotypes of Peromyscus s. prevostensis.

Males.				Females.			
Museum number.	Length.	Tail.	Hind foot.	Museum number.	Length.	Tail.	Hind foot.
100822	230	116	27	100842	228	108	28
100814	229	112	27	100825	227	116	26
100819	226	108	27	100847	222	115	27
100837	226	110	26	100849	222	108	27
100846	222	111	26	100823	221	111	27
100828	222	108	25	100812	221	110	25
100839	221	106	27	100848	220	106	27
100809	221	108	25	100840	218	107	25
100830	219	107	27	100816	216	109	26
100821	218	102	26	100850	215	106	27
100827	217	106	26	100824	213	107	26
100836	217	107	27	100833	213	103	27
100820	217	107	27	100811	212	104	26
100835	214	103	26	100817	212	104	26
100806	214	103	26	100813	211	103	26
100808	214	105	26	100844	209	99	25
100829	214	104	25	100843	208	103	25
100826	213	106	26	100841	206	98	26
100845	211	101	27	100832	206	98	27
100838	210	101	25	100834	206	100	26
100807	209	102	26				
100831	208	98	26	Average of—			
100805	208	102	26	20 females	215.3	105.7	26.2
100815	207	99	27	25 males	216.5	105.2	26.2
100810	205	97	25				
Average of 25 males	216.5	105.2	26.2	Entire series (25 males and 20 females)	216.0	105.4	26.2

There is much variation in cranial characters that must be considered individual. Most of the distinct species are fairly well characterized cranially, but the cranial characters of subspecies, when any are apparent, are exceedingly variable and seldom constant throughout a series. Often, however, they constitute average characters of considerable value. More or less tendency to dolichocephaly is sometimes found in series representing species that are normally brachycephalic, and vice versa, and in such cases, of course, nearly all parts of the skull are affected. The teeth vary chiefly in size and seldom greatly. The pattern of the grinding surfaces of teeth at different stages of wear, however, varies much, and in all comparisons of teeth is to be carefully considered.

Variability of color, while often great, is usually not strictly individual, but in most cases may be explained otherwise. It may be due to season, age, or color phase, and in some cases slight color differences, not considered specific or subspecific, seem obviously due to environmental causes and may be very local. Although there is only one complete annual molt, the constant change due to wear and its lack of uniformity in different individuals produce great variation, so that comparatively large series seldom contain two individuals absolutely identical in color. Differences due solely to age are quite constant and of much the same character throughout the genus, but they too are complicated with the wear of pelage. (See Pelages, p. 19.)

A sort of dichromatism is found in *P. m. blandus*, one phase being vinaceous gray and the other ochraceous buff. A few other forms, as *sonoriensis* and *coolidgei*, are slightly and less commonly dichromatic. Among western forms, variations of such an extremely local and sporadic nature often occur that one may almost believe them to have been produced in one or at most a very few generations. Such variations, of course, are slight, and doubtless produced immediately upon contact with certain conditions. Thus if the range of a given form includes a few square miles of lava beds, specimens from that area show an appreciably darker color than the normal form occupying the surrounding region. And whenever similar conditions are repeated elsewhere, even on a small scale, the same result seems to follow. Again, specimens from the bottom of a dark wooded canyon may be noticeably darker than those from an open hillside only a few hundred yards away. In the absence of absolute proof, one can scarcely avoid the suspicion that if the progeny of paler individuals were transferred at an early age to the habitat of darker ones, they would, quite regardless of inherent tendencies, develop a darker color, or, similarly, a lighter color if the process were reversed.

Local and geographic variations are great, so great, indeed, that, excepting a few species of very limited range, all the species have developed geographic peculiarities by means of which they have been subdivided into more or less numerous (geographic) races or subspecies. One species, *P. maniculatus*, which in its various forms ranges from sea to sea and from the Arctic Circle to the Isthmus of Tehuantepec, remains constant only where conditions are practically identical; hence it is represented by a definable subspecies in almost every faunal area which it enters. The readiness with which local variation is induced and established appears also from the large number of distinguishable insular forms. Much of the local variation, however, can not be considered subspecific. Certain forms, although preserving the same general characters throughout a definite range, nevertheless show slight and sometimes unique variations in nearly every local series from within the range. In these cases, where no two series of specimens from respective localities are exactly alike, and where no two can be associated except upon the basis of characters common to all, it is necessary to disregard slight variations and treat the entire association under one name.

INTERGRADATION.

Until recent years continuous and perfect intergradation was demonstrable only in relatively few cases. And even now, although proved beyond doubt in group after group, in many cases it is merely taken for granted. That intergradation exists even more widely than is generally supposed appears from the study of groups in which material is abundant. Of *Peromyscus* we have more complete series than of any other genus of American mammals—that is, not only are there more specimens, but many more localities are represented and the gaps in known distribution are usually few. Barriers impassable to many other mammals have little effect on these mice, for they range continuously, although not always without undergoing change, from sea level to great altitudes, and from the very humid to the very arid regions. Moreover, since usually they are so abundant and easily obtained, representatives are available from nearly every locality in North America ever visited by a mammal collector.[a] Within the range of one species (*maniculatus*) it is probable that a line, or several lines, could be drawn from Labrador to Alaska and thence to southern Mexico throughout which not a single square mile is not inhabited by some form of this species. They are wanting in the extreme north, but there is scarcely a corner south of the Arctic Circle in which they do not occur. With such wide and continuous distribution perfect intergradation must take place between related forms of different faunal areas, and with such complete collections this intergradation must be plainly evident in nearly all cases.

Classification becomes, then, as has been said,[b] like dividing the spectrum and depends largely upon the standards set, for, theoretically at least, the possibilities of subdivision are unlimited. It is not strange, therefore, that hundreds and even thousands of specimens are intergrades almost equally resembling two or more adjacent forms. Many of these intergrades for convenience may be referred with some degree of assurance to the form they most closely resemble, but many specimens fall so near the imaginary line between two or more subspecies that it is practically impossible to classify them other than as intergrades. A particularly troublesome class is one which approximates the color of one form and the cranial characters of another, thus reducing the question to one of relative importance of characters.

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[a] American collectors of wide experience, in comparing notes, regard as worthy of remark the few occasions on which they have found themselves in localities where they "couldn't catch *Peromyscus*," and in such places, as a rule, they were also unable to catch anything else.

[b] Ridgway, Birds North and Middle America, pt. I, p. x, 1901.

The description of new forms without a complete canvass of congeneric forms often has the unfortunate result of fixing names to intermediate and unrepresentative types. The same result is effected also by the describer who, though fully cognizant of relationships. does not hesitate to name a slight variation, the characters of which, as exhibited by specimens from a given locality, may prove later to be more fully developed in specimens from elsewhere. The reviser is often confronted with three names representing steps in development from one extreme to another, one of the designated forms thus being intermediate between the other two. If, as often occurs, the recognition of only two forms seems necessary, and the intermediate has been named before either of the extremes, its name, having priority, must stand, and it becomes necessary to decide which of the names representing the extremes shall be considered a synonym. It is well known that certain intermediate specimens so combine the characters of two subspecies that different authors may relegate them to different forms. It is readily seen that when such specimens are chosen as types the names of several forms may thus become as subject to change as are those on the labels of intermediate specimens. A reviser in dealing with such names is compelled first to determine the number of recognizable forms without regard to names. Then the various type specimens are referred according to their degree of resemblance to one or another of the recognizable forms—just as would be done in determining ordinary specimens. The names are then adopted or rejected according to priority and these determinations.

In several instances, particularly in the *maniculatus* group, two bona fide subspecies inhabit the same area and apparently maintain themselves distinct. Each may be traced by a different geographic route through every degree of intergradation to one parent (?) form. Thus, *arcticus* and *algidus* occur together in the upper Yukon Valley as if distinct species; *arcticus* ranges southward and eastward and intergrades with *oreas; algidus* follows the coast route and through *hylæus* and *macrorhinus* also intergrades with *oreas* (see map, frontispiece). Therefore, if natural causes, sudden or gradual, were to eliminate the intergrades with *oreas* the formation of two distinct species (*arcticus* and *algidus*), living side by side, would be complete.

Intergradation has been found quite frequently in unexpected quarters and many forms long supposed to be distinct species are now proved to be subspecies. This is significant of the result to be expected in other genera, specimens of which are less easily obtained, but which may have nearly or quite as continuous range as *Peromyscus*. Everything seems to indicate, however, that few, if any, genera of American mammals show such widely separated differentiations and at the same time such unbroken series of intergrading forms as *Peromyscus*. Even the species most widely different are connected by forms more or less combining their characters, and the same is true in a large degree of the subgenera.

PELAGES.

Like many other mammals, the mice of the genus *Peromyscus* appear to undergo only one complete annual change of pelage. The normal time for this molt, at least in temperate regions, is late summer or early fall, but from various causes the exact time is extremely variable, so that season is usually of little value for determining the pelage of a given individual. The new pelage may be acquired in regular and obvious manner with the fresh coat well distinguished from the old worn one, the growth proceeding from before backward and the middle of the rump being the last part to be invested, or the change may be quite insidious and apparent only upon careful examination. The regular method is followed in the adults of most species, while the other is more often evident in immature individuals.

The new pelage, when first acquired, is apparently unmixed with any of the preceding worn pelage, which soon entirely disappears, but new hairs continue to come in for some time, making the pelage fuller and thicker until it reaches its prime, usually in late fall and early winter. Besides the normal molt, in some cases, a distinct secondary growth or perhaps a partial molt is shown by specimens which, though apparently in fresh pelage, are, as may be seen by lifting the hairs of the back and sides, largely covered with patches of short incoming hairs of uniform character. The complete new pelage remains much the same for some time (usually during winter), and then begins to show signs of wear. This is usually first evidenced by a general brightening of color, the overlying black or dusky tips of certain hairs fading or being worn off, thus exposing more fully the various underlying shades of buff. The process of fading and abrading continues until the molt, producing various effects in different species. Commonly the dusky soon becomes almost eliminated or altered to brown or pale cinnamon, so that it blends more perfectly with the main color. In species in which dusky predominates on the back this becomes more contrasted with the sides, the dusky having been eliminated on one part sooner than on the other.

In species having comparatively little dusky, the pelage, while still full, long, and apparently little worn, may become almost entirely a bright uniform shade of buff or tawny. This condition has sometimes mistakenly been supposed to represent the very old individual in distinction from the supposed normal adult. It is true that the very bright rich colors are never assumed by the young and adolescents. But such colors appear to be only features of a stage through which any adult may pass annually, though since largely the result of external influences (abrasion and fading), they necessarily vary greatly in different individuals. Thus it often happens that the pelages of two individuals living side by side are at the end of a season in quite different stages of wear.

Besides the differences due to wear and renewal of the coat, there are three fairly distinct phases due to age—the juvenile (young in first coat), the adolescent, and the adult. The young in first coat is usually a uniform slaty gray or some similar shade.[a] The hair is slightly paler terminally than basally and is more or less woolly in appearance—at least not smooth and compact. This stage is succeeded by the adolescent pelage, which first appears on the middle of the sides. Its growth proceeds rapidly upward on each side until union is effected in the middle of the back, and then incloses the rest of the body, the rump and nape usually being the last parts to be covered. In its early stages this adolescent pelage is plainly distinguishable from the adult pelage. The hair is shorter than in the adult, the main color is duller and paler, and the dusky is more uniformly distributed. It varies but little through many species, and the general effect is usually close to broccoli brown. It is difficult to determine how long this pelage is worn, but it is doubtless renewed at latest within a year. The succeeding coat may be somewhat paler and grayer than the fully adult, but as a rule is so similar to it that further distinction is scarcely possible. Except in northern forms, breeding is continued during the greater part or all of the year (see Remarks under *P. californicus*, p. 236), so that specimens of various ages may be taken at almost all seasons.

Consideration of pelages is of the highest importance in making comparisons of closely related forms. Except in large collections, it is very difficult to find specimens of different forms absolutely comparable as to condition of pelage. Indeed, it is sometimes hard to find two absolutely comparable specimens of one form even in a large series collected at one time and place. The fact that a specimen was collected at a certain season does not always warrant assumption that its pelage is the one that is (or ought to be) representative of that season. This is particularly true of southern forms, many of which seem to change pelage regardless of season. The process of change is constant; that is, a new pelage begins to be altered slightly as soon as it is acquired, and before renewal it may pass through various stages of fading and abrading, each more or less different from the others. Add to this the different shades of color distinguishing juveniles, adolescents, adults, and senescents, and the result is an amount of variation that can be demonstrated only by large series taken at different seasons. Insufficient material, and consequent failure to appreciate these variations, have of course been the chief causes leading to the bestowal of different names upon identical forms.[a]

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[a] An exception is found in the subgenus *Ochrotomys*, in which the young are colored like the adults.

The pelages here described are placed chiefly under two heads—the 'unworn pelage,' which indicates the fresh coat in its prime, and the 'worn pelage,' which usually is that of the rather decided degree of wear shown just before the molt. The various intermediate stages between the two can be indicated only in a general way. The 'adolescent pelage' and that of the 'young in first coat' are so similar in most forms that descriptions of them have not been given in all cases.

COLOR DESCRIPTIONS.

The description of the intergrading forms of a genus like *Peromyscus* presents unusual difficulties. Differences apparent enough to any tyro are beyond the powers of description of the practiced professional. Available words constantly signify either too much or too little and in many cases may mislead. Besides differences that can be perceived but not described, others doubtless exist in the living animals that in prepared specimens are rarely even perceptible. As Bangs says:[b]

> Most of the closely related forms of white-footed mice look very different from each other when one is trapping and handling them in the flesh. This 'aspect difference' as Professor Shaler aptly calls it, is subtle and hard to define, and may disappear almost entirely when the animals are made into the conventional museum skins or preserved in spirits, thus leaving the characters on which species and subspecies are based very slight in comparison with what they were in life.

Since the general color and color pattern are so much the same throughout the genus, comparative descriptions are employed in almost all cases. In addition, although it causes some repetition, complete color descriptions are given for nearly all the forms. In every case, typical specimens have been compared carefully with the plates of Ridgway's Nomenclature of Colors for Naturalists,[c] which, though of smaller scope than is desirable and unfortunately not widely accessible, is yet the only available standard. Since general color terms are so indefinite, they have been supplemented by the terms used by Ridgway, or, if possible, they are used in the sense of the unqualified term as given by Ridgway. Thus the term *rufous* is employed in none of the variable popular senses, but to describe the shade so-called by Ridgway (No. 7, Pl. IV). Nearly every species of *Peromyscus* has two colors independently combined, and the relative amount of each can not be stated in exact terms. An attempt to obviate this difficulty has been made by defining the two colors and also the 'general effect,' that is, the color produced by the blending of the two as seen when the specimen is held in a good light at a short distance from the eyes.

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[a] However, after examining several comparatively small collections, one can only wonder that so many really correct diagnoses have been made. Forms which appear quite distinct in view of large series of perfect specimens are most difficult to distinguish with only poor material. On the other hand, differences of pelage are often magnified in small collections where two very different pelages may be represented only by series from two widely separated localities, and thus the belief that they represent different forms is easily derived.

[b] Proc. Biol. Soc. Wash., X, pp. 120–121, Nov., 1896.

[c] Boston, Mass., 1886. Now out of print.

MEASUREMENTS.

All measurements are in millimeters. Unless otherwise stated, the external measurements are those taken in the flesh by the collector, as follows: Total length (tip of nose to tip of tail); tail vertebræ (never measured to end of hairs); and hind foot (to end of longest claw). The measurement of the ear has been taken in most cases from the dry skins of specimens in which the ear has not been distorted in drying. The means and extremes of ten normal adult specimens are given so far as possible. Since there is so little sexual difference in size (see p. 15), the averages, except in special cases, are based upon series containing specimens of both sexes. Cranial measurements have been taken with great care with finely adjusted calipers reading tenths of millimeters by vernier. Although not equally valuable for all forms, the following cranial measurements have been uniformly taken:

Greatest length, the length over all from the tip of the nasals to the posterior bulge of the braincase.

Basilar length, the basilar length of Hensel from the inferior lip of the foramen magnum to the incisor.

Zygomatic width, the greatest distance between the outer sides of the zygomata.

Interorbital constriction, the width of the most constricted part of the interorbital space.

Interparietal, the greatest length and width.

Nasals, the greatest length along the suture between the nasals.

Shelf of bony palate, the distance from the posterior ends of the anterior palatine foramina to the anterior border of the interpterygoid fossa.

Palatine slits, the greatest length of the anterior palatine foramina.

Diastema, anterior base of upper molars to posterior base of incisor.

Postpalatal length, the distance from the anterior border of the interpterygoid fossa to the inferior lip of the foramen magnum.

Maxillary toothrow, the alveolar length of the three upper molariform teeth.

KEYS.

Although at the outset it appeared that a thoroughly satisfactory key to the species of *Peromyscus* was out of the question, still a key of some sort seemed imperative. Effort has been made, therefore, to devise one by means of which normal adults may be identified. In its construction all semblance of natural order is disregarded and in many cases solely geographic divisons are made. This course is objectionable, if for no other reason than that further collecting and study may extend the limits of the ranges of many species. However, the ranges of the species of *Peromyscus* are better known than those of most other mammals, and it is therefore probable that a key based on geographic ranges will be found no more subject to change than one based on natural characters. Owing to the wide variation among the subspecies of many of the species, it has been necessary to introduce the same species in various parts of the key. Keys have been attempted also for the intergrading subspecies of each species, although obviously they must prove more or less unsatisfactory. They are largely geographic and are intended only as slight aids rather than invariable guides to identification.

In revising groups of animals and plants, it is desirable that the results be made useful to as large a class as possible, in addition to professional students. The present group, however, is a subtle one, and the best that can be done will not fully meet the needs of professionals, much less of amateurs. The identification of the species of *Peromyscus* is sufficiently difficult, and that of the subspecies is a subject for experts, or at least for those having access to large collections. In most cases, the best the amateur can hope to do is to identify his specimens as to species; for his subspecific determinations he must depend largely upon the accompanying maps.

RECORDS OF SPECIMENS.

More than 27,000 specimens are recorded in the following pages, being practically all those contained in the principal American collections.

An attempt has been made to refer every specimen examined to a described species or subspecies, but it must be admitted that in the case of many intermediate specimens it makes little difference whether they are called by one or another name. The fact that two forms intergrade may be shown conclusively by specimens, but on which side of the imaginary dividing line the intergrading specimens belong must often remain largely a matter of individual opinion. Many specimens, therefore, have been referred arbitrarily to one or another of closely related forms. Such arbitrary reference is often necessary, not only in cases of intergrades, but of immature specimens or small series in noncommittal condition of pelage, and may be influenced by geography or by various considerations apart from the specimens themselves. Intermediate specimens are frequently noted as such in the records, but since there is every degree of intergradation, it is impossible to carry this plan out consistently, and therefore it can not safely be assumed that specimens are typical because they are not noted as intermediate.

SUBGENERA.

Although several superspecific groups may be characterized as subgenera within the genus *Peromyscus*, it does not appear necessary to remove any of them as independent genera. Thus the natural and well-known general concept of the genus is retained, while associations of species not formerly segregated are fully recognized by the employment of subgeneric names. Certain authors already have chosen to elevate the subgenera *Megadontomys* and *Baiomys* to generic rank[a] and other similar mammalian groups are frequently treated as genera. Some make no attempt to justify their recognition of such groups other than the claim that the characters, however slight, are unmistakable, while others urge it merely as a matter of convenience, because the groups are of "unwieldly proportions,"[b] or "as consistent with the finer ultimate divisions."[c] So far as *Peromyscus* is concerned, the finer ultimate divisions are mostly intergrading subspecies and the unwieldy proportions are caused by the masquerading of many of these subspecies as full species. The number of bona fide species scarcely exceeds forty, and of these some half dozen eventually may be reduced in rank.

The unwieldiness of a genus is properly to be judged by the number of species it contains, without regard to the subspecies. The constant tendency in taxonomic work seems toward analytic methods at the expense of synthetic. This is shown especially in the multiplication of genera which have the function merely of emphasizing some slight distinction, while the groups which formerly served to indicate resemblances of associated species are unrecognized.

Unanimity in regard to the limits of genera and subgenera is scarcely to be hoped for, but some effort may be made to preserve both the genus and subgenus as classificatory categories. Those who assume that subgenera as such are useless must necessarily recognize more and more groups as genera until the distinction between the genus and the species becomes so slight as to be of little taxonomic value, while at the same time the gap between the genus and the group of next higher rank is correspondingly increased. It is difficult to understand the reason for this attitude, for, while it is held by those who draw very fine distinctions and are only too willing to see generic significance in slight characters, it actually operates to reduce the number of categories of classification between the subfamily and the species, and thus results, not in an improved and more discriminating system of classification, but one with fewer groups and fewer possibilities for the indication of relationships.

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[a] Cf. Bangs, Bull. Mus. Comp. Zool., XXXIX, p. 27, 1902; Mearns, Mamms. Mexican Boundary, Bull. No. 56, U. S. Nat. Mus., p. 381, 1907.

[b] Cf. Bangs, Bull. Mus. Comp. Zool., XXXIX, p. 27, 1902.

[c] Allen, Princeton Exped. Patagonia, III, Zool. I, p. 165, 1905.

The use of subgenera provides a means of adjusting the differences usually existing between the general zoologist and the specialist. The generic name answers all the purposes of the general zoologist while the specialist may use as many subgenera as he desires and meet all the requirements of discriminating classification. This also operates to conciliate the amateur, whose outcries against the continual changing of names by specialists will thereby be lessened. Although these protests are often unreasonable, the specialist should remember that his scheme of nomenclature to be truly successful must answer the purposes of others as well as himself. If the specialist conservatively retains well-known and natural generic groups he may segregate subgenera indefinitely without retarding the progress of exact taxonomy, and, at the same time, without interfering with the less exacting needs of the general zoologist and the amateur. Moreover, further advantage is found in the fact that the percentage of legitimate changes of names that would confront the much-abused amateur would be greatly reduced; for changes of subgeneric names on account of preoccupation and other causes would in most cases concern only the specialist. One author[a] advocates the abolition of subgenera in order to remove the temptation to give them the rank of genera—little more than a confession of weakness. It appears to be true, however, that with some systematists the establishment of a subgenus fosters attempts to elevate it to generic rank.

Most of the subgenera of *Peromyscus* are well characterized, usually by a combination of characters; but if a single character becomes pronounced it is merely an extreme development which may be traced back by stages to a widely different condition. Thus the subgenera *Haplomylomys* and *Megadontomys*, although fairly circumscribed and definable, seem to be at opposite ends of an almost continuous series in which the subgenus *Peromyscus* combines most of their characters. The subgenus *Podomys* (including *P. floridanus* only) seems to have an absolute character in the number of its plantar tubercles, but within the subgenus *Peromyscus* there is much variation in this respect, and specimens of the *maniculatus* group occasionally have the sixth tubercle very small and nearly obsolete. The subgenus *Baiomys* is usually recognizable by small size (*P. m. pallescens*, of the subgenus *Peromyscus*, is scarcely larger), but most of its characters are to be found elsewhere in the genus. *Ochrotomys* is a subgenus based upon a single aberrant form (*P. nuttalli*), which seems to have no very close relatives, although its general characters are obviously those of *Peromyscus*.

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[a] Hartert, Auk, XXIII, pp. 120–122, Jan. 1906.

HABITS AND ECONOMIC STATUS.

The various species of this genus have widely different local habitats. Some inhabit woodland, others swamps and watercourses, some open upland prairies, and others rocks, cliffs, and arid desert regions. Even single species live under a surprising diversity of conditions. All are habitually nocturnal, though occasionally individuals under unusual circumstances may be seen abroad by day. They wander widely at night, and unlike the meadow mice (*Microtus*) do not form beaten runways. They do not hesitate, however, to freely utilize such runways made by other rodents. Collectors soon learn to recognize the places most frequented by them, but in a region where they abound they may be caught in traps set in almost every conceivable situation. Although sometimes welcomed by the inexperienced collector, to whom they insure a catch of some sort, they are a source of annoyance to the more ambitious trapper, who finds them continually springing traps set for more desirable species.

Many of them doubtless burrow to some extent, but in most cases those that live underground occupy natural openings or retreats formed by other animals. Crevices in rocks and cliffs are the favorite haunts of many species. The prairie forms, as *P. m. bairdi* and others, are said to make short, simple burrows in the ground in which their nests of soft grass are placed. The woodland forms, as *P. leucopus*, though living largely on the ground, are to some extent arboreal, and *P. nuttalli* is largely so. They build their nests among roots and in old stumps and hollow trees, often occupying the deserted nesting cavities of birds, as woodpeckers, bluebirds, and chickadees. Sometimes also a bird's nest in a small bush is appropriated and temporarily used, or perhaps remodeled and permanently occupied. That they also climb about to some extent in trees not occupied as nesting sites is often evidenced by the presence of their dried droppings in crevices and crotches at some distance from the ground. They do not hibernate, but remain active throughout the winter, even in northern latitudes.

Although the food habits of various species are not quite the same, in general it may safely be said that very few feed extensively upon green and succulent food such as is taken by the meadow mice, but nearly all prefer dry food, especially seeds and small nuts. In captivity they are omnivorous, and, like the house mouse, find everything in man's larder palatable. Sometimes, when confined, they turn cannibals, and even in their natural habitat will often devour the dead bodies of their own kind or of other mice that have been caught in traps. The common form of the northeastern United States (*P. l. noveboracensis*) is especially fond of basswood seeds, pits of wild cherries, beechnuts, and acorns, and often stores them in burrows or in cavities in old stumps. It eats also seeds of many wild shrubs, weeds, and grasses. In wooded regions or on waste land, where it commonly lives, it is not very injurious to agriculture, but when living about the edges of cultivated ground it sometimes devours or carries away grain in considerable quantities. Kennicott records[a] that in western New York there was found "within a stump in a clover field, several quarts of clean seed of red clover collected by a family of these mice." It occasionally gnaws the bark of young fruit trees or nursery stock, but such harm is more often due to meadow mice (*Microtus*).

Doubtless more damage is done by western forms than eastern, as many of the former are less confined to woodland. Thus *P. m. bairdi* and other forms of the *maniculatus* group, being naturally inhabitants of open ground, readily betake themselves to cultivated fields under the conditions of advancing civilization. In such cases, although grain and other products form only a small part of their food, they do considerable injury on account of their great numbers. Throughout practically all of the western United States they exist in countless numbers, perhaps exceeding those of the other combined mammalian inhabitants of the region. They are extremely prolific, bearing from 4 to 6 young in a litter and breeding throughout the entire year, at least in temperate regions. Evidently whatever their food habits, these mice must play an important part in maintaining the balance of nature, and no doubt they partially offset some of their damage by consuming the seeds of noxious weeds.

Nearly all the species readily enter buildings in search of food and, finding an easy living, make themselves permanently at home. They do not often live in large cities nor where the house mouse (*Mus musculus*) is established, as that species, though smaller than most species of *Peromyscus*, seems able to drive them away. The domestic depredations are therefore confined to rural districts and small towns not yet infested by house mice. In such places, particularly in the north, they are quite as pestiferous as house mice, cutting up fabrics for nest materials, destroying all kinds of foodstuffs, and doing much damage about granaries, straw or hay stacks, and outbuildings. In the interior of Canada they infest trappers' lonely cabins and levy tribute on the provisions, and at trading posts they enter warehouses and damage the merchandise. Under such circumstances they are similar in habits to house mice, and can be destroyed by the same methods—trapping or poisoning—but they can be kept out of premises only by constant vigilance, for those killed are soon replaced from the limitless supply of the neighboring woods and fields.

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[a] Agricultural Report for 1856, U. S. Patent Office, p. 91, 1857.

On the whole they are less injurious to agricultural interests than meadow mice, but nevertheless they are vermin and their undue increase should be checked. This can be accomplished best by trapping and poisoning, as in the case of meadow mice.[a] On account of their more decidedly nocturnal habits, they are preyed upon by hawks less than meadow mice, but they are eaten in large numbers by nearly all species of owls. The smaller carnivorous mammals also, especially weasels, are among their enemies, and the larger snakes destroy them to some extent. The continued decrease of these predaceous animals through a mistaken persecution by man must result in a great increase of these and other mice. Owls at least should be protected by law, and a knowledge of the important part played by harmless snakes in destroying these and other noxious rodents should be disseminated as widely as possible, especially among children.

List of species and subspecies of Peromyscus, with type localities.

Subgenus PEROMYSCUS.

Name.	Type locality.
Maniculatus group:	
P. maniculatus	Labrador.
P. m. gracilis	Michigan.
P. m. abietorum	James River, Nova Scotia.
P. m. argentatus	Grand Manan Island, New Brunswick.
P. m. eremus	Magdalen Islands, Quebec.
P. m. nubiterræ	Roan Mountain, North Carolina.
P. m. arcticus	Fort Simpson, Mackenzie.
P. m. oreas	Mount Baker Range, British Columbia.
P. m. hylaeus	Prince of Wales Island, Alaska.
P. m. algidus	Lake Bennett, British Columbia.
P. m. keeni	Queen Charlotte Islands, British Columbia.
P. m. macrorhinus	Mouth Skeena River, British Columbia.
P. m. artemisiæ	Ashcroft, British Columbia.
P. m. saturatus	Saturna Island, British Columbia.
P. m. hollisteri	San Juan Island, Washington.

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[a] See Bailey, N. Am. Fauna No. 17, p. 8, 1898; Lantz, Yearbook U. S. Dept. Agric. for 1905, pp. 363–376, 1906.

Name.	Type locality.
Maniculatus group—Continued.	
P. m. austerus	Fort Steilacoom, Washington.
P. m. rubidus	Mendocino, California.
P. m. gambeli	Monterey, California.
P. m. rufinus	San Francisco Mountain, Arizona.
P. m. nebrascensis	Calf Creek, Montana.
P. m. luteus	Kennedy, Nebraska.
P. m. bairdi	Bloomington, Illinois.
P. m. pallescens	San Antonio, Texas.
P. m. blandus	Escalon, Chihuahua.
P. m. fulvus	Oaxaca, Oaxaca.
P. m. labecula	Ocotlan, Jalisco.
P. m. sonoriensis	Santa Cruz, Sonora.
P. m. coolidgei	Santa Anita, Lower California.
P. m. margaritæ	Margarita Island, Lower California.
P. m. clementis	San Clemente Island, California.
P. m. catalinæ	Catalina Island, California.
P. m. dubius	Todos Santos Island, Lower California.
P. m. geronimensis	San Geronimo Island, Lower California.
P. m. cineritius	San Roque Island, Lower California.
P. m. magdalenæ	Magdalena Island, Lower California.
P. sitkensis	Sitka, Alaska.
P. s. prevostensis	Queen Charlotte Islands, British Columbia.
P. polionotus	Georgia.
P. p. albifrons	Whitfield, Florida.
P. p. niveiventris	Opposite Micco, Florida.
P. p. phasma	Anastasia Island, Florida.
P. p. rhoadsi	Anclote River, Florida.
P. melanotis	Las Vigas, Veracruz.
Leucopus group:	
P. leucopus	Near mouth of Ohio River.
P. l. noveboracensis	New York.
P. l. ammodytes	Monomoy Island, Massachusetts.
P. l. fusus	Marthas Vineyard, Massachusetts.
P. l. aridulus	Fort Custer, Montana.
P. l. ochraceus	Winslow, Arizona.
P. l. tornillo	El Paso, Texas.
P. l. arizonæ	Fairbank, Arizona.
P. l. texanus	West central Texas.
P. l. mesomelas	Orizaba, Veracruz.
P. l. castaneus	Yohaltun, Campeche.
P. l. affinis	Barrio, Oaxaca.
P. l. cozumelæ	Cozumel Island, Yucatan.
P. gossypinus	Riceboro, Georgia.
P. g. megacephalus	Woodville, Alabama.
P. g. palmarius	Opposite Micco, Florida.
P. g. anastasæ	Anastasia Island, Florida.
Boylei group:	
P. boylei	Middle Fork American River, California.
P. b. rowleyi	Noland Ranch, Utah.
P. b. attwateri	Kerr County, Texas.
P. b. spicilegus	San Sebastian, Jalisco.

Name.	Type locality.
Boylei group—Continued.	
P. b. simulus	San Blas, Tepic.
P. b. madrensis	Tres Marias Islands, Mexico.
P. b. evides	Juquila, Oaxaca.
P. b. levipes	Mount Malinche, Tlaxcala.
P. b. aztecus	Mirador, Veracruz.
P. oaxacensis	Cerro San Felipe, Oaxaca.
P. hylocetes	Patzcuaro, Michoacan.
P. pectoralis	Jalpan, Queretaro.
P. p. eremicoides	Mapimi, Durango.
P. p. laceianus	Kerrville, Texas.
Truei group:	
P. truei	Fort Wingate, New Mexico.
P. t. gilberti	Bear Valley, California.
P. t. martirensis	San Pedro Martir Mountains, Lower California.
P. t. lagunæ	Laguna Mountains, Lower California.
P. t. gratus	Tlalpam, Mexico.
P. t. gentilis	Lagos, Jalisco.
P. nasutus	Estes Park, Colorado.
P. polius	Colonia Garcia, Chihuahua.
P. difficilis	Valparaiso Mountains, Zacatecas.
P. d. amplus	Coixtlahuaca, Oaxaca.
P. d. felipensis	Cerro San Felipe, Oaxaca.
P. bullatus	Perote, Veracruz.
Melanophrys group:	
P. melanophrys	Santa Efigenia, Oaxaca.
P. m. zamoræ	Zamora, Michoacan.
P. m. consobrinus	Berriozabal, Zacatecas.
P. xenurus	Durango, Durango.
P. mekisturus	Chalchicomula, Puebla.
Lepturus group:	
P. lepturus	Mount Zempoaltepec, Oaxaca.
P. lophurus	Todos Santos, Guatemala.
P. simulatus	Jico, Veracruz.
P. nudipes	La Carpintera, Costa Rica.
P. furvus	Jalapa, Veracruz.
P. guatemalensis	Todos Santos, Guatemala.
P. altilaneus	Todos Santos, Guatemala.
Mexicanus group:	
P. mexicanus	Mirador, Veracruz.
P. m. totontepecus	Totontepec, Oaxaca.
P. m. teapensis	Teapa, Tabasco.
P. m. saxatilis	Jacaltenango, Guatemala.
P. m. gymnotis	Guatemala.
P. allophylus	Huehuetan, Chiapas.
P. banderanus	Valle de Banderas, Tepic.
P. b. vicinior	La Salada, Michoacan.
P. b. angelensis	Puerto Angel, Oaxaca.
P. yucatanicus	Chichenitza, Yucatan.
P. y. badius	Apazote, Campeche.

Name.	Type locality.
Megalops group:	
P. megalops	Near Ozolotepec, Oaxaca.
P. m. auritus	Near Oaxaca, Oaxaca.
P. m. melanurus	Pluma, Oaxaca.
P. melanocarpus	Mount Zempoaltepec, Oaxaca.
P. zarhynchus	Todos Santos, Guatemala.

Subgenus MEGADONTOMYS.

P. thomasi	Near Chilpancingo, Guerrero.
P. nelsoni	Jico, Veracruz.
P. flavidus	Boquete, Chiriqui.

Subgenus OCHROTOMYS.

P. nuttalli	Norfolk, Virginia.
P. n. aureolus	South Carolina.

Subgenus PODOMYS.

P. floridanus	Gainesville, Florida.

Subgenus HAPLOMYLOMYS.

P. crinitus	Shoshone Falls, Idaho.
P. c. auripectus	Bluff City, Utah.
P. c. stephensi	San Diego County, California.
P. californicus	Monterey, California.
P. c. insignis	Dulzura, California.
P. eremicus	Fort Yuma, California.
P. e. anthonyi	Grant County, New Mexico.
P. e. phaeurus	Hda. La Parada, San Luis Potosi.
P. e. tiburonensis	Tiburon Island, Sonora.
P. e. fraterculus	Dulzura, California.
P. e. cedrosensis	Cedros Island, Lower California.
P. e. eva	San Jose del Cabo, Lower California.
P. e. avius	Ceralbo Island, Lower California.
P. e. insulicola	Espiritu Santo Island, Lower California.
P. e. polypolius	Margarita Island, Lower California.
P. goldmani	Alamos, Sonora.

Subgenus BAIOMYS.

P. taylori	San Diego, Texas.
P. t. subater	Near Columbia, Texas.
P. t. paulus	Rio Sestin, Durango.
P. t. analogus	Zamora, Michoacan.
P. musculus	Colima, Colima.
P. m. brunneus	Jalapa, Veracruz.
P. m. nigrescens	Valley of Comitan, Chiapas.

New subspecies.

Name.	Type locality.
P. maniculatus eremus	Magdalen Islands, Quebec.
P. maniculatus algidus	Lake Bennett, British Columbia.
P. maniculatus hollisteri	San Juan Island, Washington.
P. maniculatus margaritæ	Margarita Island, Lower California.
P. maniculatus magdalenæ	Magdalena Island, Lower California.
P. polionotus albifrons	Whitfield, Florida.
P. leucopus aridulus	Fort Custer, Montana.
P. leucopus ochraceus	Winslow, Arizona.
P. truei lagunæ	La Laguna, Lower California.
P. megalops melanurus	Pluma, Oaxaca.
P. eremicus insulicola	Espiritu Santo Island, Lower California.
P. eremicus avius	Ceralbo Island, Lower California.
P. eremicus polypolius	Margarita Island, Lower California.
P. taylori analogus	Zamora, Michoacan.

Key to subgenera.

a. Plantar tubercles 6.

  b. Coronoid process of mandible small and but slightly elevated, or, if not, then hind foot more than 16.

    c. Two principal outer angles of $\underline{\text{m}}$ 1 and $\underline{\text{m}}$ 2 with more or less well-developed accessory tubercles or enamel loops (see Pl. VIII, figs. 2, 2*a*); mammæ $\frac{3}{3}$ (i. $\frac{2}{2}$, a. $\frac{0}{0}$, p. $\frac{1}{1}$).

      d. Ears dusky or dusky edged with whitish, in slight contrast to color of body; posterior palatine foramina about midway between interpterygoid fossa and anterior palatine foramina; dentine spaces of molars mostly confluent.

        e. Size small to large; hind foot less than 32 (except in *guatemalensis* and *zarhynchus*); outer accessory tubercles or loops of $\overline{\text{m}}$ 1 and $\overline{\text{m}}$ 2 only slightly developed ____________ *Peromyscus* (p. 32)

        ee. Size very large; hind foot always more than 30; outer accessory tubercles or loops of $\overline{\text{m}}$ 1 and m 2 well developed. *Megadontomys* (p. 218)

      dd. Ears bright ochraceous, same color as body; posterior palatine foramina nearer to interpterygoid fossa than to anterior palatine foramina; dentine spaces of molars mostly closed ___________ *Ochrotomys* (p. 222)

    cc. Two principal outer angles of $\underline{\text{m}}$ 1 and $\underline{\text{m}}$ 2 simple, without accessory cusps or enamel loops or with rudimentary ones (see Pl. VIII, figs. 3–4); mammæ $\frac{2}{2}$ (i. $\frac{2}{2}$, a. $\frac{0}{0}$, p. $\frac{0}{0}$) ___________________________________ *Haplomylomys* (p. 228)

  bb. Coronoid process of mandible well developed; size very small, hind foot not more than 17 ____ *Baiomys* (p. 252)

aa. Plantar tubercles 5 ____ *Podomys* (p. 226)

Genus PEROMYSCUS Gloger.

Hesperomys Waterhouse, Zool. Voy. H. M. S. *Beagle*, Pt. II, Mamm., pp. 74–77, 1839—in part only.

Peromyscus Gloger, Hand und Hilfsbuch Naturgesch., I, pp. xxx, 95, 1841; Thomas, Ann. and Mag. Nat. Hist., ser. 6, XIV, p. 364, Nov., 1894; XV, pp. 190, 192, Feb., 1895. Type, *Peromyscus arboreus* (=*P. l. noveboracensis*).

Sitomys Fitzinger, Sitzungsber. Math.-Nat. Cl. K. Akad. Wiss., Wien, LVI, p. 97, 1867; Merriam, Proc. Biol. Soc. Wash., VII, p. 27, 1892. Type, *Cricetus myoides* (=*P.? l. noveboracensis*).

Vesperimus Coues, Proc. Acad. Nat. Sci. Phila., p. 178, 1874; Allen, Bull. Am. Mus. Nat. Hist., III, p. 224, May 7, 1891. Type, *Hesperomys leucopus* (=*Peromyscus leucopus*).

Baiomys True, Proc. U. S. Nat. Mus., XVI, p. 758, Feb. 7, 1894. Type, *Hesperomys* (*Vesperimus*) *taylori* (=*Peromyscus taylori*).

Trinodontomys Rhoads, Proc. Acad. Nat. Sci. Phila., pp. 256–257, Oct., 1894. Type, *Sitomys insolatus* (=*P. l. sonoriensis*).

Megadontomys Merriam, Proc. Biol. Soc. Wash., XII, pp. 115–116, 125, fig. 20, Apr. 30, 1898. Type, *Peromyscus thomasi.*

Haplomylomys Osgood, Proc. Biol. Soc. Wash., XVII, pp. 53–54, Mar. 21, 1904. Type, *Hesperomys eremicus* (=*Peromyscus eremicus*).

Podomys Osgood, *postea*, p. 226. Type, *Hesperomys floridanus* (=*Peromyscus floridanus*).

Ochrotomys Osgood, *postea*, p. 222. Type, *Arvicola nuttalli* (=*Peromyscus nuttalli*).

Type.—"(*Peromyscus arboreus* [*Cricetus myodes*!! Gapper])" Gloger, 1841 =*Peromyscus leucopus noveboracensis* (Fischer).

Generic characters.—Form murine; tail long, at least more than one-third of total length, often decidedly more than half; tail with scaly annulations more or less concealed by hair; ears relatively large, membranous, and thinly clothed with hair; soles of hind feet 5–6–tuberculate, hairy proximally or naked medially to calcaneum; internal cheek pouches more or less developed; mammæ $\frac{2}{2}$ or $\frac{3}{3}$.

Skull with braincase rather thin-walled, smooth, and but little ridged; supraorbital border smoothly rounded, sharp-angled, or beaded; interparietal well developed; zygomata slender, depressed to level of palate; infraorbital foramen compressed-triangular, bounded on the outside by a broad thin plate; anterior palatine foramina long, slitlike, and separated by a thin bony septum; posterior border of palate squared or rounded, without lateral pits, and situated about even with plane of posterior roots of last molars; audital bullæ more or less inflated and obliquely situated. Ramus of mandible relatively long, slender, and straightened; coronoid process (except in *Baiomys*) short and slightly developed; mandible but slightly expanded by base of root of lower incisor. Molars rather weak, brachyodont and tuberculate, the tubercles in two longitudinal series or in four incomplete longitudinal series consisting of two principal median series and two much subordinated lateral series; upper molars 3-rooted, lower 2-rooted; molar series decreasing in size from before backward, the third upper molar subcircular and usually less than half as large as the second; first upper molar with 5 principal tubercles, an anterior median one and two pairs of lateral ones (the anterior one partially divided in *Megadontomys*), with or without subsidiary tubercles in the salient angles; upper incisors without grooves.

Subgenus **PEROMYSCUS** Gloger.

Subgeneric characters.—Pattern of color usually bicolor, the underparts usually white and sharply distinguished from the upperparts;[a] young in first coat differently colored from adults;[b] ears more or less dusky, somewhat contrasted with rest of upperparts;[a] plantar tubercles 6;[b] mammæ $\frac{3}{3}$ (i. $\frac{2}{2}$, a. $\frac{0}{0}$, p. $\frac{1}{1}$).[c] Posterior palatine foramina about midway between interpterygoid fossa and anterior palatine foramina;[f] coronoid process of mandible usually small and only slightly elevated; accessory tubercles present in salient angles of first and second upper molars;[d] outer accessory tubercles of $\overline{\text{m}}1$ and $\overline{\text{m}}2$ only slightly developed;[e] dentine spaces of worn molars mostly confluent.[f]

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[a] Distinguishing from *Baiomys* and *Ochrotomys.*

[b] Distinguishing from *Ochrotomys.*

Key to species of the subgenus Peromyscus.[g]

Adults.

- *a.* Hind foot 25 or less.
  - *b.* Tail less than 150.
    - *c.* Tail shorter than head and body.
      - *d.* Ears very large, longer than hind foot. Mexico........*P. bullatus* (p. 183)
      - *dd.* Ears moderate, shorter than hind foot. Mexico and northward.
        - *e.* Size very small; hind foot 15–19; tail usually less than 60.
          - *1.* Habitat Florida and Georgia.................*P. polionotus* (p. 103)
          - *2.* Habitat Texas to Canada. *P. maniculatus* (*pallescens*, *bairdi*, etc.) (p. 37)
        - *ee.* Size larger; hind foot 19–25; tail usually more than 60.
          - *f.* Total length less than 210; hind foot less than 25.
            - *g.* Tail usually very sharply bicolor and penicillate; white spot at anterior base of ear present or absent; palatine slits usually long and nearly parallel-sided.
              - *1.* Rostrum longer (nasals about 11); no white spot at anterior base of ear. Mountains of Mexico.......*P. melanotis* (p. 109)
              - *2.* Rostrum shorter (nasals usually less than 11); white spot at base of ear present or absent..........*P. maniculatus* (p. 37)
            - *gg.* Tail less distinctly bicolor, slightly or not at all penicillate; no white spot at anterior base of ear.
              - *1.* Size averaging larger. Southern United States. *P. gossypinus* (p. 135)
              - *2.* Size averaging smaller. United States, southeastern Canada, and Mexico..............................*P. leucopus* (p. 112)
          - *ff.* Total length more than 210; hind foot about 25..*P. hylocetes* (p. 159)
    - *cc.* Tail equal to or longer than head and body.
      - *d.* Tail uniform black or brownish all around.
        - *e.* Tail scaly and nearly naked.....................*P. allophylus* (p. 206)
        - *ee.* Tail soft-haired and penicillate.
          - *1.* Size larger; hind foot 23–25..................*P. lophurus* (p. 192)
          - *2.* Size smaller; hind foot 21..................*P. simulatus* (p. 193)
      - *dd.* Tail more or less bicolor.
        - *e.* Skull with supraorbital border more or less beaded or at least elevated: tail usually irregularly blotched below. Tropical Mexico and Guatemala.
          - *f.* Habitat Peninsula of Yucatan..............*P. yucatanicus* (p. 211)
          - *ff.* Habitat south and east of Yucatan.
            - *1.* Supraorbital bead well developed with a distinct sulcus on inner side. Western Mexico.................*P. banderanus* (p. 207)
            - *2.* Supraorbital border slightly beaded. Southern Mexico and Guatemala................................*P. mexicanus* (p. 198)
        - *ee.* Skull with supraorbital border sometimes sharp-angled but never decidedly beaded nor elevated. Alaska to Guatemala.
          - *f.* Habitat highlands of Chiapas and Guatemala.
            - *1.* Tail clothed with soft hairs and decidedly pencilled; pelage soft and dull.................................*P. lophurus* (p. 192)

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[a] Distinguishing from *Baiomys* and *Ochrotomys*.

[b] Distinguishing from *Podomys*.

[c] Distinguishing from *Baiomys* and *Haplomylomys*.

[d] Distinguishing from *Haplomylomys*.

[e] Distinguishing from *Megadontomys*.

[f] Distinguishing from *Ochrotomys*.

[g] For explanation of keys see p. 23.

ff. Habitat north of Chiapas.

g. Ears relatively large; ear from notch in dry skin 18–25.

h. Tarsal joints white like upper side of hind foot. *P. polius* (p. 177)

hh. Dusky of hind leg reaching tarsal joint and more or less extended on it, or, if not, then hind foot less than 25.

1. Ears larger; rostrum shorter (nasals about 10); zygomata more squarely elbowed; audital bullæ larger. Western United States and Mexico------------------------*P. truei* (p. 165)

2. Ears smaller; rostrum longer (nasals about 11); zygomata more compressed anteriorly; audital bullæ smaller. Western United States----------------------*P. nasutus* (p. 176)

gg. Ears smaller; ear from notch in dry skin 18 or less.

h. Hind foot 23 or more.

i. Habitat United States, Alaska, and Canada.

j. Tail about equal to or only slightly longer than head and body, usually less than 90. Habitat east of 110th meridian.

1. Size averaging larger; color darker. Habitat chiefly east of the 97th meridian------*P gossypinus* (p 135)

2. Size averaging smaller; color paler. Habitat chiefly west of the 97th meridian-------*P. leucopus* (p. 112)

jj. Tail always longer than head and body, usually more than 90. Habitat chiefly west of the 95th meridian.

k. Habitat north of the State of Oregon.

1. Size larger; hind foot at least 25. Habitat islands off coast of Alaska and British Columbia. *P. sitkensis* (p. 101)

2. Size smaller; hind foot 23–25. Habitat Alaska, Canada, and Washington. *P. maniculatus* (*oreas, macrorhinus, etc.*) (p. 87)

kk. Habitat south of the State of Oregon. *P. boylei* (p. 141)

ii. Habitat Mexico.

j. Tarsal joint white like upper side of hind foot. *P. polius* (p. 177)

jj. Dusky of hind leg reaching to and often more or less over tarsal joint.

k. Tail usually less than 90, rather finely haired and slightly or not at all penicillate; principal color ranging from pale fawn to dusky brownish, seldom bright buff or tawny------------*P. leucopus* (p. 112)

kk. Tail not less than 90, usually more than 100, a little more coarsely haired and usually more decidedly penicillate; principal color often brighter buff or tawny.

1. Tail relatively longer; hind foot 23–25. *P. boylei* (p 141)

2. Tail relatively shorter; hind foot rarely less than 25------------------------*P. hylocetes* (p. 159)

hh. Hind foot not more than 23.

i. Tail about equal to or only slightly longer than head and body, usually less than 90.

j. Tail very sharply bicolor and slightly penicillate; with or without a white spot at anterior base of ear. *P. maniculatus* (p. 37)

jj. Tail less sharply bicolor and slightly or scarcely penicillate; without a white spot at anterior base of ear.

1. Size averaging larger; color usually darker. Habitat Austroriparian zone of southern United States. *P. gossypinus* (p. 135)

2. Size averaging smaller; color usually paler. Southeastern Canada to southeastern Mexico. *P. leucopus* (p. 112)

ii. Tail always longer than head and body, usually more than 90.

j. Habitat United States, Canada, Alaska, and Lower California.

k. Tarsal joints white like upper side of hind foot. *P. pectoralis* (p. 160)

kk. Dusky of hind leg extending to and more or less over tarsal joint.

l. Proximal half of sole of hind foot hairy; tail closely haired, sharply bicolor, and slightly penicillate; with or without white spot at anterior base of ear. Chiefly northern or coastwise. *P. maniculatus* (p. 37)

ll. Proximal fourth or less of hind foot hairy; tail loosely hairy and penicillate; without white spot at anterior base of ear. Chiefly southern and interior.

1. Size larger; skull heavier; greatest length of skull 27 or more ---- *P. boylei* (p. 141)

2. Size smaller; skull lighter; greatest length of skull 26 or less ---- *P. crinitus*[a] (p. 229)

jj. Habitat Mexico (except Lower California).

k. Dusky of hind leg extending to and more or less over tarsal joint.

1. Size larger; tail relatively shorter; maxillary toothrow usually 4 or more ---- *P. boylei* (p. 141)

2. Size smaller; tail relatively longer; maxillary toothrow usually less than 4 ---- *P. pectoralis* (p. 160)

kk. Tarsal joint white like upper side of hind foot.

1. Size large; hind foot more than 23. *P. polius* (p. 177)

2. Size smaller; hind foot less than 23. *P. pectoralis* (p. 160)

bb. Tail more than 150 ---- *P. mekisturus* (p. 189)

aa. Hind foot 25 or more.

b. Habitat entirely south of Canada.

c. Tail rather short, not more than 90 ---- *P. gossypinus* (p. 135)

cc. Tail always more than 90.

d. Forearm and forefoot blackish or partly so to base of digits. *P. melanocarpus* (p. 216)

dd. Dusky of forearm not extending beyond carpal joint.

e. Size very large; hind foot 30 or more.

f. Total length more than 300 ---- *P. zarhynchus* (p. 217)

ff. Total length less than 300.

g. Supraorbital border more or less beaded. Habitat Oaxaca and Guerrero ---- *P. megalops* (p. 213)

gg. Supraorbital border not beaded.

1. Larger. Habitat Chiapas and Guatemala. *P. guatemalensis* (p. 193)

2. Smaller. Habitat Costa Rica and Panama ---- *P. nudipes* (p. 195)

ee. Size smaller; hind foot less than 30.

f. Tarsal joint white like upper side of hind foot ---- *P. polius* (p. 177)

ff. Dusky of hind leg extending at least to tarsal joint.

g. Habitat Costa Rica and Panama ---- *P. nudipes* (p. 195)

gg. Habitat north of Costa Rica.

h. Ear from notch in dry skin not more than 19.

i. Dusky of hind leg extending over upper side of hind foot at least halfway to base of toes.

j. Skull with a slight supraorbital bead.

1. Size smaller; maxillary toothrow less than 5. *P. mexicanus* (p. 198)

2. Size larger; maxillary toothrow 5 or more. *P. megalops* (p. 213)

jj. Skull without bead.

k. Color chiefly dusky; tail blackish all around or at least with basal part of underside somewhat dusky.

1. Smaller; tail less than 120 ---- *P. lepturus* (p. 190)

2. Larger; tail more than 120 ---- *P. furvus* (p. 196)

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[a] This species belongs with the subgenus *Haplomylomys*, but as it is somewhat connectant and easily misplaced, it is included in this key as well as in that to *Haplomylomys*.

- *kk.* Color chiefly tawny or ochraceous; tail sharply and evenly bicolor------------*P. boylei* (p. 141)
- *ii.* Dusky of hind leg not extending halfway to base of toes.
  - *j.* Supraorbital border slightly to strongly beaded, or, if not, then tail not evenly bicolor.
    - *k.* Size smaller; hind foot not more than 26. Peninsula of Yucatan----------*P. yucatanicus* (p. 211)
    - *kk.* Size larger; hind foot 26–30.
      - *l.* Tail blackish all around----*P. megalops* (p. 213)
      - *ll.* Tail blotched with whitish on underside or sometimes evenly bicolor.
        - *m.* Size larger; maxillary toothrow 5 or more. *P. furvus* (p. 196)
        - *mm.* Size smaller; maxillary toothrow less than 5.
          - *1.* Supraorbital border strongly beaded (except in subspecies *angelensis*). Western Mexico north of the Isthmus of Tehuantepec-*P. banderanus* (p. 207)
          - *2.* Supraorbital border slightly beaded. Southern and eastern Mexico and Guatemala---*P. mexicanus* (p. 198)
  - *jj.* Supraorbital border often sharp-angled but not beaded; tail evenly and usually sharply bicolor.
    - *k.* Total length 240 or more------*P. oaxacensis* (p. 158)
    - *kk.* Total length less than 240.
      - *1.* Tail relatively longer; hind foot 23–25. *P. boylei* (p. 141)
      - *2.* Tail relatively shorter; hind foot rarely less than 25----------------------*P. hylocetes* (p. 159)
- *hh.* Ear from notch in dry skin more than 19.
  - *i.* Supraorbital border slightly beaded or at least somewhat elevated.
    - *j.* Tail less than 120. Guatemala---*P. altilaneus* (p. 197)
    - *jj.* Tail more than 120, or, if not, then habitat north of Guatemala.
      - *k.* Sides of face chiefly grayish; tail not less than 130, usually more than 140; tail evenly bicolor (except in *P. xenurus*, confined to the State of Durango).
        - *1.* Tail evenly (not always sharply) bicolor. ***P. melanophrys*** (p. 184)
        - *2.* Tail dusky brownish all around except a poorly defined whitish line on under side. *P. xenurus* (p. 188)
      - *kk.* Sides of face chiefly tawny, ochraceous, or dusky; tail entirely dusky, irregularly blotched below, or evenly bicolor.
        - *1.* Size larger; maxillary toothrow 5 or more; braincase broad; pelage usually long. *P. megalops* (p. 213)
        - *2.* Size smaller; maxillary toothrow less than 5; braincase usually narrower; pelage usually short--------------------*P. mexicanus* (p. 198)
  - *ii.* Supraorbital border not beaded nor elevated.
    - *1.* Tail blackish or blotched with whitish below; nasals expanded anteriorly------------------*P. furvus* (p. 196)
    - *2.* Tail evenly bicolor; audital bullæ rather large. *P. difficilis* (p. 178)
- *bb.* Habitat islands off the coast of Alaska and British Columbia--*P. sitkensis* (p. 101)

Key to subspecies of Peromyscus maniculatus.

- *a.* Habitat Alaska and Canada.
  - *b.* **Habitat** east of the 100th meridian.
    - *c.* Habitat islands off coast of Nova Scotia and New Brunswick.
      - *1.* Color grayer; tail longer. Grand Manan Id---------------*P. m. argentatus*
      - *2.* Color browner; tail shorter. Magdalen Ids-------------------*P. m. eremus*

cc. Habitat mainland.

d. Tail shorter, averaging less than 90; hind foot rather large. Hudsonian zone, Labrador to Hudson Bay, etc---------- *P. maniculatus*

dd. Tail longer, averaging more than 90.

1. Color grayer. Nova Scotia, New Brunswick, etc---------- *P. m. abietorum*

2. Color more tawny or buffy. Southern Ontario and Quebec-- *P. m. gracilis*

bb. Habitat west of the 100th meridian.

c. Tail about equal to or shorter than head and body, usually less than 90.

d. Color darker. Chiefly forested regions north and west of Great Plains.

e. Color very dark. Islands and coast of British Columbia.

1. Size smaller; hind foot 19–21; lateral line less prominent. *P. m. austerus*

2. Size larger; hind foot 21–22; lateral line more prominent. Saturna Island---------- *P. m. saturatus*

ee. Color somewhat paler. Chiefly east of the coast ranges.

f. Skull longer; braincase wider. Chiefly southern British Columbia. *P. m. artemisiae*

ff. Skull smaller; braincase smaller. Northwest Canada-- *P. m. arcticus*

dd. Color paler, usually chiefly bright ochraceous buff. Great Plains of Saskatchewan, etc---------- *P. m. nebrascensis*

cc. Tail longer than head and body, usually more than 90, often more than 100.

d. Size larger; hind foot 24–25. Coast of northern British Columbia and Alaska---------- *P. m. macrorhinus*

dd. Size smaller; hind foot 21–24.

e. Tail and ears averaging longer. Southern British Columbia-- *P. m. oreas*

ee. Tail and ears averaging shorter. Northern British Columbia and Alaska.

f. Color more grayish. Headwaters of Yukon River---------- *P. m. algidus*

ff. Color more brownish. Coastal.

1. Skull lighter; rostrum longer. Alaska---------- *P. m. hylaeus*

2. Skull heavier; rostrum shorter. Queen Charlotte Islands. *P. m. keeni*

aa. Habitat United States and Mexico.

b. Habitat United States.

c. Habitat east of the Mississippi River.

d. Tail long, always more than 80, usually more than 90.

e. Color more grayish. Eastern Maine---------- *P. m. abietorum*

ee. Color more brownish or dusky. Northern States and Appalachian Mountains.

1. Size larger; dark dorsal area less distinct. Minnesota to New Hampshire. *P. m. gracilis*

2. Size smaller; dark dorsal area more distinct. Western Pennsylvania to northern Georgia---------- *P. m. nubiterrae*

dd. Tail 70 or less. Mississippi Valley---------- *P. m. bairdi*

cc. Habitat west of the Mississippi River.

d. Size smaller; hind foot rarely more than 19; tail rarely more than 60; greatest length of skull 22–25.

e. Size very small; hind foot 15–17. Texas---------- *P. m. pallescens*

ee. Size larger; hind foot 18–20. Chiefly north of Texas.

f. Color chiefly dark brown or blackish---------- *P. m. bairdi*

ff. Color chiefly ochraceous buff.

1. Size smaller---------- *P. m. luteus*

2. Size larger---------- *P. m. nebrascensis*

dd. Size larger; hind foot rarely less than 20; tail 55–120; greatest length of skull rarely less than 25.

e. Tail longer, averaging more than 90, frequently more than 100.

1. Size larger; hind foot 22–24. Cascade Mountains and coast of Washington---------- *P. m. oreas*

2. Size smaller; hind foot 21–22. Coast of Oregon and northern California---------- *P. m. rubidus*

ee. Tail shorter; averaging less than 90, usually less than 80.

f. Color paler, ochraceous buff or vinaceous predominating.

g. Tail averaging shorter. Chiefly east of the Rocky Mountains.

1. Color more buffy. Northern Texas to central Montana. *P. m. nebrascensis*

2. Color more vinaceous. Western Texas and southern Mexico. *P. m. blandus*

gg. Tail averaging longer. Great Basin region and southeastern California ---------- *P. m. sonoriensis*

ff. Color darker; dusky, dark brown, or tawny ochraceous predominating.

g. Color very dark. Chiefly coast of Puget Sound.

1. Size larger; tail relatively shorter; skull larger and heavier. San Juan Island ---------- *P. m. hollisteri*

2. Size smaller; tail relatively longer; skull small and light. *P. m. austerus*

gg. Color somewhat paler. Chiefly Rocky Mountain region and California (except northwest coast and eastern desert regions).

h. Size larger; skull broader and heavier; nasals usually 11 or more. Eastern Washington, Idaho, Montana, and Wyoming. *P. m. artemisiæ*

hh. Size smaller; skull lighter; nasals usually less than 11.

i. Color more tawny ochraceous, especially in winter pelage. Southern Rocky Mountains, Colorado, Utah, Arizona, and New Mexico ---------- *P. m. rufinus*

ii. Color more dusky, except in worn pelage. California.

j. Averaging smaller and paler. Mainland of California. *P. m. gambeli*

jj. Averaging larger and darker. Santa Barbara Islands.

1. Smaller; tail and ears shorter ---------- *P. m. clementis*

2. Larger; tail and ears longer ---------- *P. m. catalinæ*

bb. Habitat Mexico.

c. Habitat mainland and islands of Lower California.

d. Size larger; hind foot 20–23; greatest length of skull usually more than 26. Chiefly insular.

e. Color decidedly grayish, chiefly pale écru drab. San Roque Island. *P. m. cineritius*

ee. Color less grayish, chiefly buffy or ochraceous, more or less mixed with dusky.

f. Color darker. Coronados and Todos Santos Islands ---------- *P. m. dubius*

ff. Color paler.

1. Size smaller. San Geronimo, Natividad, and San Martin Islands. *P. m. geronimensis*

2. Size larger. Magdalena Island and adjacent mainland. *P. m. magdalenae*

dd. Size smaller; hind foot 19–20; greatest length of skull usually less than 26. Chiefly mainland of Lower California (except *margaritae*.)

e. Color darker, usually with considerable dusky mixture. Northwestern. *P. m. gambeli*

ee. Color paler, chiefly pinkish buff or ochraceous buff.

f. Very pale, chiefly pale pinkish buff. Margarita Island. *P. m. margaritae*

ff. Not so pale, chiefly ochraceous buff. Mainland of Lower California.

1. Paler, usually with buffy shades toned down by whitish. Southern and central Lower California ---------- *P. m. coolidgei*

2. Not so pale, usually with buffy shades entirely predominating. Northeastern ---------- *P. m. sonoriensis*

cc. Habitat continental Mexico (i. e., all except Lower California).

d. Color paler, chiefly buffy ochraceous or pale vinaceous; size slightly smaller; hind foot averaging less than 22. Chiefly northern.

1. Size slightly smaller; tail shorter, averaging less than 70; color more vinaceous. Chiefly east of the Sierra Madre ---------- *P. m. blandus*

2. Size slightly larger; tail longer, averaging more than 70; color more buffy. Chiefly west of the Sierra Madre ---------- *P. m. sonoriensis*

dd. Color darker, chiefly russet or dusky; size slightly larger; hind foot usually 22 or more. Chiefly southern.

1. Color more dusky ---------- *P. m. labecula*

2. Color more rufescent ---------- *P. m. fulvus*

PEROMYSCUS MANICULATUS (WAGNER).

(Pl. II, fig. 1.)

Hesperomys maniculatus Wagner, Wieg. Archiv. f. Naturgesch., XI (1), p. 148, 1845.

[*Hesperomys*] *arcticus* Sauss., Coues, Monogr. N. Am. Rod., p. 67, 1877—*nomen nudum.*

Peromyscus canadensis umbrinus Miller. Proc. Bost. Soc. Nat. Hist., XXVIII, p. 23, April, 1897—Peninsula Harbor, Ontario.

Peromyscus maniculatus Bangs, Am. Nat., XXXII, p. 496, 1898.

Type locality.—Labrador; doubtless one of the old Moravian settlements on the northeast coast: specimens from Nain used for present diagnosis.

Geographic distribution.—Hudsonian zone of northeastern Canada, from the northeastern coast of Labrador to the west side of Hudson Bay and south to the border of the Canadian zone to meet the range of *P. m. gracilis.*

Characters.—Size medium; tail moderately long, about half the total length or slightly more; coloration regular, median dorsal region somewhat contrasted; under side of hind feet hairy except on pads and spaces between them; tail well haired, sharply bicolor and distinctly penciled.

Color.—Adult in August: Sides and lateral upperparts dark brown (Mars brown), tinged with fawn; median dorsal region darker (mummy brown), beginning behind shoulders and extending with decreasing width to base of tail; orbital region and base of whiskers blackish; ears dusky with pale edges; preauricular lanuginous tuft with a few white hairs; underparts white, not entirely concealing plumbeous undercolor; feet white; tail sharply bicolor, brownish black above, white below. Adolescent pelage: Head, sides, and lateral upperparts sepia produced by mixture of black and shades of buff; median dorsal region and thence to base of tail black with only slight admixture of lighter; tail intense black above; ears black or blackish outside, whitish inside, edges sharply white; otherwise as in adult. Young in first coat: General color slate gray, overlaid with white on underparts.[a]

Skull.—Size larger than in *P. m. gracilis;* braincase rather broad and flattened, shallower than in *gracilis* or *arcticus;* nasals longer and narrower than in *arcticus;* rostrum light; palatine slits rather long and nearly parallel-sided.

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[a] Description based on series of well-made skins collected by W. E. Clyde Todd in summer of 1901 for the Carnegie Museum of Pittsburg, supplemented by a number of flat and otherwise poorly made skins (now in the Museum of Comparative Zoology) collected by the Moravians for J. D. Sornborger, who kindly loaned them for study.

Measurements.—Average of 9 adults from Nain and Windsor Harbor, Labrador: Total length 179 (174–198); tail vertebræ 84 (75–95); hind foot 21 (19–23). Of 5 adults from Oxford House, Keewatin: 188.8 (185–193); 93 (88–95); 20.

Type specimen.—A specimen having every claim to acknowledgment as the type of this species is in the Zoologischer Staats-Sammlung of Munich, Bavaria, where I was permitted to examine it through the courtesy of Professor Hertwig and his assistant, Doctor Leisewitz. An early label attached to it has the following data: "*Hesperomys maniculatus* Wagn. Dr. Barth dst 1844. Labrador." The pelage is considerably faded and the specimen, although now removed from its stand, is still in mounted posture and has the wires and glass eyes of an exhibition specimen. Otherwise it is in good condition and all its general characters are obvious, as sharply bicolor and slightly penicillate tail, white margined ears, soft pelage, and so on. No skull accompanies the skin. The hind foot measures 20.5 mm., and the tail, which is intact but shrunken over the vertebræ, measures 64 mm.

Remarks.—This was the first to be named and almost the last to be recognized of a large group of inosculating forms—the largest and most remarkable of the genus, and perhaps of American mammals. Its distribution is wider and the number of intergrading forms and of individuals is greater than in any similar group of mammals known. From typical *maniculatus*, development may be traced step by step absolutely without break through all the numerous subspecies. Throughout the group many interesting problems of distribution and development are presented; these are discussed so far as space will permit in connection with the descriptions of the forms concerned. Typical *maniculatus* is most similar to subspecies *arcticus*, merely having a slightly longer tail and slight cranial differences. Specimens from the Hudson Bay region, though referable to *maniculatus*, approach *arcticus* and *gracilis*. Typical *maniculatus* differs from *gracilis* in shorter tail, darker color, greater extent of dusky on dorsum, and in cranial characters, notably broader, flatter braincase. From *arcticus*, it is distinguished by longer tail and by average cranial characters, as wider braincase, and longer, narrower nasals. Specimens of *gracilis* from Godbout and Lake Edward, Province of Quebec, are almost typical, showing only slight tendency toward *maniculatus*.

Specimens from the north shore of Lake Superior described under the name *umbrinus* seem best referred to *maniculatus*. A large series from Isle Royale, Michigan, is almost like series from the Hudson Bay region and can scarcely be referred to *gracilis*. Others from immediately south of Lake Superior, however, are longer tailed and lighter colored and are indistinguishable from specimens from northern New York. These are taken as representing typical *gracilis*. The type of *gracilis*, supposed to have come from Michigan, has such a long tail that presumably it came from the southern or central part of the State.

Specimens examined.—Total number 239, from localities as follows:

Keewatin:[a] Echimamish River, 17; Hayes River, 25 miles above York Factory, 1; Hill River, 9; Norway House, 9; Oxford House, 13; Oxford Lake, 8; Pine Lake, 8; Robinson Portage, 15; Sea River Falls, 4; Shamatawa River, 4; Steele River, 2; Trout Falls, 1; York Factory, 36.

Labrador: Great Whale River, 1; Hopedale, 3; Labrador, 2; Makkovik, 5; Nain, 18; Rama, 2; Windsor Harbor, 18.

Michigan:[a] Isle Royale, 55.

Ontario:[a] Moose Factory, 1; Peninsula Harbor, 7.

PEROMYSCUS MANICULATUS GRACILIS (LE CONTE).

(Pl. II, fig. 5; Pl. VII, fig. 12; Pl. VIII, fig. 6.)

Hesperomys gracilis Le Conte, Proc. Acad. Nat. Sci. Phila., VII, p. 442, 1855.

Sitomys americanus canadensis Miller, Proc. Biol. Soc. Wash., VIII, pp. 55–69, June 20, 1893—Peterboro, N. Y.

Peromyscus gracilis Lyon and Osgood, Bull. No. 62, U. S. Nat. Mus., p. 131, Jan. 27, 1909.

Type locality.—Michigan.[b]

Geographic distribution.—Northeastern United States and southern Canada from northern Minnesota east through northern Wisconsin, Michigan, Ontario, Quebec, New York, and western New England. Canadian zone.

Characters.—Similar to *maniculatus*, but color slightly less clouded with dusky; hind foot smaller; tail longer, actually and relatively; skull smaller and narrower. Superficially similar to *noveboracensis*, but tail longer, more distinctly penciled, and more sharply bicolor; pelage softer; skull more slender; molar teeth smaller.

Color.—Unworn pelage (fall and winter): Ground color varying from russet through cinnamon to isabella color, more nearly russet on flanks and posterior part of back, becoming grayer and more nearly isabella color across shoulders and on top of head; dusky mixture moderate throughout, somewhat concentrated in middle of back; general effect on sides nearly raw umber, on dorsum same but strongly blackish, on shoulders rusty hair brown; ears blackish, narrowly edged with whitish, often with a few white hairs at anterior bases; narrow orbital ring and spot at base of whiskers blackish; underparts white; feet white, forearm usually slightly dusky, 'ankles' dusky; tail blackish above, white below. Worn pelage (spring and early summer): Similar to unworn pelage, but dusky mixture more or less eliminated or changed to shades of cinnamon which are scarcely contrasted with the ground color; general effect dull cinnamon on sides, shading to russet or Mars brown on dorsum; markings about face, ankles, and upper side of tail brownish instead of blackish. Adolescent pelage: General effect of upperparts broccoli brown, hair brown or nearly isabella color. Young in first coat: General effect of upperparts hair brown to sepia, usually somewhat blackish or slaty in middle of back.

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[a] All approaching *gracilis* and *arcticus*.

[b] In the absence of proof to the contrary, Michigan may be taken as the type locality of *gracilis*, in accordance with the statement of the original description and notwithstanding the queries on the labels of the type specimen.

Skull.—Similar to that of *maniculatus*, but smaller and narrower; braincase not so broad nor so flattened. Also similar to that of *arcticus*, but narrower, with zygomata less widely 'elbowed' anteriorly and nasals longer and narrower. Slightly similar to that of *noveboracensis*, but braincase narrower, nasals longer, maxillaries less bulging in front of infraorbital foramen, anterior part of zygomata lighter, palatine slits longer and more nearly parallel-sided; molar teeth smaller.

Measurements.—Two adults from Porcupine Mountains, Ontonagon County, Mich.: Total length, 192, 178; tail vertebræ, 95, 114; hind foot, 22, 20. Average of 9 adults from Tower, Minn., 186 (174–200), 90 (80–104), 19.8 (19–21); of 10 adult males from Peterboro, N. Y., 190 (176–206), 96.8 (85–108), 21.4 (20.8–21.8); of 10 adult females from Peterboro, N. Y., 178 (171–200), 89 (84–100), 20.7 (19.8–21.8).

Type specimen.—No. $\frac{10292}{38002}$ U. S. National Museum evidently is the type of *Hesperomys gracilis* Le Conte. It agrees perfectly with the original description and has passed as the type for more than thirty years. It bears several labels, among them, one in the hand of Doctor Coues, as follows: "*Hesp. gracilis.* Le Conte's type specimen. Wisconsin? Ohio? Michigan?" In the Museum catalogue under No. 10292 occurs the remark "Dry type of *gracilis*" (entry made in 1872).

The specimen is in poor condition. The skin consists of the anterior and posterior parts connected by thread and cotton. The left hind foot and the tail are present, and also the ears, which are in fair condition. The tail measures approximately 95 millimeters—the tip has been broken off. The skull has been removed and is sufficiently complete to show important characters. The posterior part has been broken away, including the greater part of the braincase and the sphenoid and occipital regions. The tips of the nasals are slightly broken. The teeth and both mandibles are intact.

Remarks.—Under the name *canadensis*, this form has become well known in recent years. It is the long-tailed mouse of the northeastern United States as opposed to the shorter tailed *noveboracensis* with which it has often been confused. It is really quite distinct from *noveboracensis*, and adult specimens of the two are readily distinguishable by both external and cranial characters. Immature or poorly prepared specimens, however, are sometimes difficult to determine. Although living in the same general localities, *gracilis* and *noveboracensis* are nearly always confined to different local habitats, *gracilis* showing preference for the colder, more moist places, or deep, mostly coniferous, woods; *noveboracensis* for the warmer, dryer, more open country, or deciduous woods.

Like the other members of the *maniculatus* series, *gracilis* grades into surrounding forms by scarcely perceptible degrees. On the north and east it meets *maniculatus* and *abietorum;* on the northwest, *arcticus;* and on the south, *nubiterræ*. Large series from the Hudson Bay region referred to *maniculatus* plainly approach *arcticus*, being darker and shorter tailed than *gracilis*. They so nearly combine the characters of *maniculatus*, *gracilis*, and *arcticus* that without violence they might be placed with any of the three. In the same way, specimens from New Hampshire approach *abietorum*, and others from Pennsylvania tend toward *nubiterræ*. Even specimens from Peterboro, N. Y., the type locality of '*canadensis*' show slight tendency toward *abietorum*, but they are much nearer to *gracilis*, and as there is scarcely room for three forms in this series, *canadensis* is not recognized.

The application of the name *gracilis* to this form seems incontestable (regardless of the supposed type specimen, which unquestionably belongs to this form), because the measurements given in the original description could not possibly apply to *noveboracensis*. The original description is as follows:

> Hair dark slate-color above, a little tipped with brown, cheeks, line above the mouth, chin, throat, and body beneath white, allowing the dark color of the lower part of the hair to shine through in such a manner as to cause these parts to appear grey. Outer side of fore legs brownish, thighs slate colored both above and beneath, feet pale grey, nearly white. Head narrow, nose somewhat pointed, ears large, open, narrowly edged with whitish. Tail longer than head and body.
>
> Length 3.8 in. Tail 4 in. * * *
>
> Inhabits Michigan; Prof. Baird.

Specimens examined.—Total number 234, from localities as follows:

Massachusetts: Mount Graylock, 2.
Michigan: Park Siding, 5; Porcupine Mountains, 4;[a] Suny, 4.
Minnesota: Bridgman, 3; Minnesota, 4; Tower, 14; Two Harbors, 2.
New Hampshire: Dublin, 1; Mount Washington, 16; Ossipee, 3.
New York: Alder Creek, 3; Catskill Mountains, 13; Elizabethtown, 2; Lake George, 1; Locust Grove, 16; Mountain View, 3; Peterboro, 68; Piseco, 4.

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[a] Coll. Univ. of Michigan. Submitted for examination by Prof. C. C. Adams.

Ontario: Algonquin Park, 11; Bracebridge, 1;[a] Deer Park, 3;[a] Grand Bend, 1; Gravenhurst, 2; Michipicoten Island, Lake Superior, 4; North Shore, Lake Superior (Agassiz), 1; Port Franks, 3; Sand Lake, 1.

Quebec: Godbout, 2; Lac aux Sables, 3; Lake Edward, 6; Murray Bay, 11.

Vermont: Burlington, 1; Mount Mansfield, 9.

Wisconsin: Eagle River, 7 (approaching *maniculatus*).

PEROMYSCUS MANICULATUS ABIETORUM Bangs.

Peromyscus canadensis abietorum Bangs, Proc. Biol. Soc. Wash., X, 49–50, Mar. 9, 1896.

Type locality.—James River, Nova Scotia.

Geographic distribution.—Nova Scotia and neighboring parts of eastern Canada; west to central Maine.

General characters.—Similar to *P. m. gracilis*, but paler and grayer.

Color.—No. 2201 Bangs Collection, in slightly worn summer pelage: Similar to *P. m. gracilis*, but paler and grayer; upperparts and sides almost uniform drab, with very fine dusky grizzling and scarcely any indication of a dark dorsal stripe; orbital region and base of whiskers with weak dusky markings; tail brownish black above, white below; underparts white. Full winter pelage (No. 1473 U. S. National Museum): Almost as in same pelage of *P. m. gracilis*, being not grayer, but slightly browner; general color bister, with a tinge of fawn color, this produced by grizzling of pale fawn color and dusky; back essentially like sides; underparts pure snowy white.

Skull.—Essentially as in *P. m. gracilis*.

Measurements.—Type: Total length, 200; tail vertebræ, 103; hind foot, 20. Average of 10 adults from Third Mopang Lake, Maine: 177 (171–187); 91.6 (82–97); 21 (20–22).

Type specimen.—No. 2205, Museum of Comparative Zoology, Cambridge, Mass. ♀ adult, Aug. 8, 1894. Formerly same number, Collection of E. A. and O. Bangs. Well-made specimen accompanied by full data including flesh measurements taken by the collector, C. H. Goldthwait.

Remarks.—The series upon which this form was named consists largely of immature specimens, most of which are somewhat overstuffed, causing paleness, which is more apparent than real. It is evident, however, that *abietorum* averages grayer than *gracilis*, as shown by a considerable series from northeastern Maine, which seems to be referable to this form rather than to *gracilis*. Between this form and *arcticus* there is gradual intergradation, *arcticus* being darker and shorter-tailed and *abietorum* paler and longer-tailed. Between the two there seems to be room for the recognition of only one intermediate form. Two names have been proposed, *gracilis* and *canadensis*, and, although specimens from their respective type localities are not exactly alike, they resemble each other more than they resemble either of the extremes, *arcticus* and *abietorum*. Therefore *gracilis*, the one named earlier, is recognized.

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[a] Collection of Canadian Geological Survey.

Specimens examined.—Total number 191, from localities as follows:

Maine: Big Deer Isle, 1; Blue Hill, 2; Bucksport, 1; Columbia Falls, 1; Greenville, 1; King and Bartlett Lake, 11; Mount Katahdin, 9; Third Mopang Lake, 25; Sebec Lake, 1; South Twin Lake, Penobscot County, 44; Upton, 2.

New Brunswick: Arthurette, 1; Gulquac Lake, Victoria County, 3; Hampton, 4; Tobique Point, 1; Forks Tobique Point River, 19; Tobique River, 4; Trousers Lake, 24.

Nova Scotia: Digby, 1; Halifax, 1; James River, 17.

Quebec: Port Daniel, 6; Riviere du Loup, 8; Saint Rose du Degele, 1; Salmon Lake, 1.

Prince Edward Island: Kensington, 2.

PEROMYSCUS MANICULATUS ARGENTATUS Copeland and Church.

Peromyscus canadensis argentatus M. Copeland and M. L. Church, Proc. Biol. Soc. Wash., XIX, pp. 122–123, Sept. 6, 1906.

Type locality.—Grand Harbor, island of Grand Manan, New Brunswick.

Geographic distribution.—Island of Grand Manan, New Brunswick.

Characters.—Similar to *P. m. abietorum*, but tail averaging slightly shorter, and color more grayish, with dusky mixture more copious and intense; similar to *P. maniculatus*, but color decidedly more grayish.

Color.—Unworn pelage: Similar to that of *abietorum*, but slightly grayer, less buffy; dusky mixture stronger and more intense; subterminal zone of hairs of upperparts narrower and paler; general effect of upperparts varying from drab to broccoli brown and hair brown, mid-dorsal region often so mixed with dusky as to produce an effect approaching slate gray; underparts white, quite concealing slaty undercolor; ears blackish, faintly edged with paler; orbital ring and spot at base of whiskers intense blackish; tail sharply bicolor, blackish above, white below.

Skull.—As in *P. maniculatus*.

Measurements.—Average of 23 topotypes: Total length, 180 (171–194); tail vertebræ, 87.8 (82–93); hind foot, 21.2 (20–22).

Type specimen.—No. 168, Collection of Manton Copeland, Taunton, Mass. ♂ adult, Sept. 19, 1905. Manton Copeland and Morton L. Church. Specimen in good condition.

Remarks.—This insular form combines to some extent the characters of typical *maniculatus* and *abietorum*, though grayer than either. It is about the same size as *maniculatus* and in its grayish coloration approaches *abietorum*. Many adults closely resemble immature examples of *abietorum*.

Specimens examined.—Total number 46, all from the type locality.

PEROMYSCUS MANICULATUS EREMUS subsp. nov.

Type from Pleasant Bay, Grindstone Island, Magdalen Islands, Quebec. No. 150223, U. S. National Museum, Biological Survey Collection. ♀ adult, Aug. 9, 1907. W. H. Osgood.

Characters.—Similar to *P. m. abietorum*, but color darker and tail shorter; similar to *P. maniculatus*, but paler and slightly smaller.

Color.—Similar in general to typical *maniculatus*, but paler throughout, yet darker than *abietorum*. Type in fresh fall pelage: Ground color of upperparts russet, uniformly and rather liberally mixed with dusky, producing a general effect slightly lighter than Prout brown; concentration of dusky mixture in middle of back comparatively slight; a distinct dusky orbital ring and spot at base of whiskers; underparts creamy white; tail sharply bicolor.

Skull.—Practically as in *P. m. abietorum*; somewhat smaller and narrower than in *maniculatus*.

Measurements.—Type: Total length, 183; tail vertebræ, 83; hind foot, 21; ear from notch (dry), 15.7 (15–16). Average of 10 topotypes: 181 (172–189); 83 (78–90); 21.

Remarks.—This island form differs in color more decidedly from *P. m. abietorum*, which occurs on the mainland of Nova Scotia and New Brunswick, than it does from typical *maniculatus* of Labrador. It is in fact nearly intermediate between *abietorum* and *maniculatus*, being darker than the former and paler than the latter.

Specimens examined.—Total number 19, all from the type locality.

PEROMYSCUS MANICULATUS NUBITERRAE RHOADS. CLOUDLAND MOUSE.

Peromyscus leucopus nubiterrae Rhoads, Proc. Acad. Nat. Sci. Phila., pp. 187–188, April, 1896.

Peromyscus canadensis nubiterrae Rhoads, *ibid.*, p. 213, May, 1897.

Type locality.—Summit of Roan Mountain, North Carolina, altitude 6,370 feet.

Geographic distribution.—Allegheny and Blue Ridge Mountains and adjacent ranges from western Pennsylvania south to western North Carolina, and northeastern Georgia.[a] Canadian zone.

Characters.—Similar to *gracilis* but slightly smaller; dusky area in middle of back broader and better defined. Tail longer than head and body; skull quite small; pelage very soft.

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[a] The occurrence of *P. m. nubiterrae* in Georgia is not indicated on the distribution map (Plate I), as specimens from that State were not received until after the plate was printed.

Color.—Much as in *gracilis* but usually with a broader, better defined, dusky dorsal area, particularly in unworn pelage. Topotype No. 54491 in full winter pelage (January): Sides of body, head, and shoulders russet, thickly sprinkled with blackish, producing a general effect approximating Prout brown; back from shoulders to base of tail broadly blackish brown, sparingly relieved with russet; underparts pure creamy white entirely dominating the slaty basal color; ears dusky, rather sharply edged with whitish; small white tufts at anterior bases of ears; a narrow dusky orbital ring and spot at base of whiskers; feet white, 'ankles' dusky; tail dusky brownish above, white below. Topotype No. 73121 in partly worn pelage (July 20): Sides cinnamon tinged with fawn; back brownish.

Skull.—Similar to that of *gracilis*, but averaging decidedly smaller; very much smaller and lighter than in *leucopus* and *gossypinus*.

Measurements.—Type: Total length 170; tail vertebræ 87; hind foot 20.5. Two adult topotypes: 173, 188; 93, 98; 21, 19.5.

Type specimen.—No. 3664 Collection Academy of Natural Sciences, Philadelphia. ♂ adult, June 19, 1895. Samuel N. Rhoads. Specimen in good condition.

Remarks.—This form is not strongly characterized, but seems worthy of recognition, particularly since it is a divergent, or what may be called a peripheral development, not standing between any two oppositely characterized forms. Its peculiarities, though not absolutely constant, are shared by a majority of individuals. The skulls from the type locality are variable, perhaps indicating that the small size and other characteristics are not as yet thoroughly established. The dark color more nearly approaches that of true *gracilis* than it does that of specimens from New York and New England, all of which tend more or less toward *abietorum*.

Specimens examined.—Total number 175, from localities as follows:

Georgia: Brasstown Bald, 12.
Maryland: Bittinger, 6; Finzel, 19; Grantsville, 16.
North Carolina: Highlands, 7; Pisgah Ridge, Transylvania County, 6;[a] Roan Mountain (4,700–6,300 feet), 36.
Pennsylvania: Drury Run, 1; Eaglesmere, Sullivan County, 4; King Station, Cambria County, 9; Lake Ganoga, Sullivan County, 2; Mount Pocono, 2; near Round Island, Clinton County, 2; Summit Mills, Somerset County, 19.
Tennessee: Holston Mountains, 1.
Virginia: Mount Rogers, 4; Peaks of Otter, 2; Skyland, Page County, 1; Tazewell Peak, 1.
West Virginia: Black Mountain, 5; Cold Knob Mountains, 1; Jobs Knob 6; Travelers Repose, 10; White Sulphur, 3.

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[a] Coll. Biltmore Forest School.

PEROMYSCUS MANICULATUS ARCTICUS (MEARNS).

(Pl. I, fig. 2.)

Hesperomys leucopus arcticus[a] Mearns, Bull. Am. Mus. Nat. Hist., N. Y. II, p. 285, Feb., 1890.

Peromyscus maniculatus arcticus Osgood, N. Am. Fauna No. 19, p. 33, Oct., 1900.

Type locality.—Fort Simpson, Mackenzie, Canada.

Geographic distribution.—Interior of northwest Canada; from southeastern Saskatchewan north along the Mackenzie River at least to Fort Norman; west to the upper waters of the Yukon, and thence south to eastern Alberta. Canadian and Hudsonian zones.

Characters.—Similar to *maniculatus*, but tail shorter; nasals shorter and wider. Similar to *gracilis*, but slightly more dusky throughout; tail shorter: skull broader and heavier. Similar to *nebrascensis*, but decidedly darker, less ochraceous; tail slightly longer; skull broader. Similar to *artemisiæ* and *oreas*, but tail shorter; skull shorter and more angular.

Color.—Unworn pelage (November): Ground color of upperparts isabella color to cinnamon, quite heavily and uniformly mixed with dusky, which is slightly or not at all concentrated in middle of back; general effect thus produced varying from grayish cinnamon to drab or hair brown, much like the adolescent pelage of related forms; orbital ring and spot at base of whiskers strongly blackish; white hairs in basal ear tufts usually well developed; underparts creamy white; tail deep dusky, almost black, above, white below; 'ankles' sharply blackish. Worn pelage (April–August): General effect of sides cinnamon, shading into pale russet in middle of back; 'ankles' dusky brownish; tail dusky brownish; otherwise similar to unworn pelage. Adolescent pelage: Slightly grayer and more dusky than in unworn adult; ground color of upperparts nearly drab; general effect hair brown to blackish mouse gray. Young in first coat: General effect mouse gray to slate color, often quite blackish in middle of back.

Skull.—Similar to that of *gracilis*, but averaging larger and heavier; nasals wider; infraorbital part of zygomata heavier; entire skull shorter relative to its width; lower lip of foramen magnum broader and condyle more sharply notched on each side. The same characters in greater or less degree also distinguish it from the skulls of *nebrascensis*, *rufinus*, *artemisiae*, and *oreas*, the only other forms to which it is closely related.

Measurements.—Average of 25 adults and adolescents from the type locality: Total length, 160 (150–172); tail vertebræ, 71 (62–78);

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[a] The name *arcticus* was published as a *nomen nudum* in 1877—*cf.* Coues, Monogr. N. Am. Rod., p. 67.

hind foot, 20 (19–21); ear from notch (dry), 15.8 (15–16.8). Of 5 adults from the upper Athabaska River (approaching *oreas*): 179 (168–193); 85 (80–91); 20.

Type specimen.—No. 5555, Museum of Comparative Zoology, Cambridge, Mass.; formerly No. 4531, U. S. National Museum. ♂ young adult, Sept. 7, 1859. Robert Kennicott. Skin in fair condition with all parts intact. Head and neck show slight effect of recent moistening, evidently done in removing the skull. Hind feet turned under body, but in good condition; tail perfect. Color rather paler than in recently collected topotypes, doubtless due to fading, which renders the specimen unreliable for close comparisons. Skull with zygomata not 'squared' greatly as in older individuals; crowns of teeth scarcely worn. Zygomata somewhat broken; basioccipital and sphenoid region cut out in a long rectangle.

Remarks.—*P. m. arcticus* is the only member of the genus inhabiting the great forested region of the interior of northwest Canada. Its range in this region is very wide, evidently covering the entire Canadian section and entering the Hudsonian at some points. Throughout the center of its range it is very constant in character, but around the edges it is unstable and intergradation with various forms is evident. Its relationships might still be a puzzle but for the large series recently secured by the expeditions of Edward A. Preble. Specimens from the lower Athabaska River are quite typical, but those from the upper river have increasingly longer tails, and certain individuals from the extreme headwaters near Henry House, Alberta, are almost like *oreas*. The evidence that *arcticus* as it ranges westward into the mountains gradually merges with *oreas* is thus almost complete. On the east the chain of intergrades is less complete, but sufficient to show that *arcticus*, as it ranges down the Saskatchewan River, intergrades with *gracilis* or *maniculatus*. On the south it meets *nebrascensis*, which replaces it on the open plains. Intermediates between the two are abundant, a series from Osler, Saskatchewan, perhaps containing the greatest number. About the upper waters of the Lewes River, of the Yukon drainage, *arcticus* [a] is found in company with *algidus* and apparently distinct from it, though elsewhere the two are connected. Such a state of affairs, however, is not unique, as it is found in several other cases in the extraordinary *maniculatus* group.

The interrelations of *arcticus*, *oreas*, and *artemisiae* are extremely difficult to understand. Further material from the interior of British Columbia will be required before many doubtful points can be satisfactorily cleared up. That all three forms intergrade with each other, however, and in turn with *gambeli*, *sonoriensis*, etc., is scarcely to be doubted.

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[a] These western specimens of *arcticus* are slightly smaller than typical, but not sufficiently so to be separable.

Specimens examined.—Total number 1,043, from localities as follows:

Alberta: Athabaska Lake (outlet), 15; Athabaska Landing, 22 (5 miles above 8; 30 miles above 14); Athabaska River, 22 (Brulé Rapid 3, Cascade Rapid 1, Crooked Rapid 2, Grand Rapids 5, 60 miles above Grand Rapids 3, Mountain Rapid 2, Pelican Rapid 3, 50 miles above Pelican Rapid 2, Swift Current 1); Banff, 10; Blindman River, 5; Braggs Crossing, 4;[a] Buffalo Lake, 10; Calgary, 7 (approaching *nebrascensis*); Canadian National Park, 15; Canmore, 2; Crows Nest Pass, 5;[a] Edmonton, 3;[a] Fish Creek, 3;[a] Forks Blindman and Red Deer rivers, 7; Fort Chipewyan, 22; Fort McMurray, 1; Grand Cache River, 6;[b] Henry House, 26;[c] Jasper House, 6;[b] Miette River, 1;[a] Moose Mountain, 3; Moose River, 4;[a] Muskeg Creek, 13;[b] Peace River Landing, 14;[a] Red Deer, 5; Red Deer River, 15 (approaching *nebrascensis*); St. Albert, 1; Slave River, 31 (near mouth Peace River 17, Smith Landing 14); South Edmonton (=Strathcona), 49; Sturgeon River, 1.[a]

British Columbia: Cariboo, 1; Cheonnee Mountains, 6; Level Mountain, 3; Raspberry Creek, 10; Shesley River, 3; Telegraph Creek, 272.

Mackenzie: Fort Norman, 6; Fort Providence, 21; Fort Rae, 63; Fort Resolution, 109; Fort Simpson, 78; Fort Smith, 39; 60 miles below Fort Smith, 2; Fort Wrigley, 2; Great Slave Lake (islands east of Fort Resolution), 4; Nahanni River Mountains, 4; mouth Nahanni River, 5; Willow River, near Fort Providence, 2.

Saskatchewan: Carlton, 5; Indian Head, 38; Wingard, 11.

Yukon: Fifty Mile River, 3; Lewes River, 2; Lake Lebarge, 17; Lake Marsh, 8; White Horse Rapids, 1.

PEROMYSCUS MANICULATUS OREAS Bangs.

Peromyscus oreas Bangs, Proc. Biol. Soc. Wash., XII, p. 84, Mar. 24, 1898.

Type locality.—Mount Baker Range (altitude 6,500 feet), British Columbia.

Geographic distribution.—Mountains and coast of western Washington, north to southern British Columbia, south to Columbia River.

Characters.—Size rather large (hind foot 22–24); tail very long (seldom less than 100, usually more than 110); color very dark and rich. Similar in general to *arcticus*, but color darker and richer; tail and hind foot longer; ears larger. Similar to *austerus*, but size decidedly larger; color averaging much less blackish; skull larger and broader.

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[a] Collection of Canadian Geological Survey.

[b] Approaching *oreas*.

[c] The majority of this series are intermediate between *arcticus* and *oreas*, but a few specimens are almost as long-tailed as *oreas*. Possibly they are still more closely allied to *algidus*.

Color.—Unworn pelage: Ground color of upperparts cinnamon to russet, slightly paler on anterior half of body; dusky mixture rather strong, but not predominating except in middle of back, where it shows as a broad, irregular blackish patch; eye with a well-defined sooty ring around it; a prominent sooty spot at base of whiskers; underparts creamy white; feet white, forearm dusky and tawny, 'ankles' dusky brownish; ears dusky, very narrowly edged with whitish; very little or no white at anterior base of ear; tail blackish brown above, white below. Worn pelage:[a] Sides bright russet to Mars brown; middle of back Mars brown to mummy brown; dusky mixture variously eliminated and changed to shades of brownish. Adolescent pelage: Upperparts pale cinnamon uniformly mixed with dusky, producing a general effect of broccoli brown tinged with fawn.

Skull.—Size slightly larger than in *arcticus;* nasals, palatine slits, and general rostral region longer; infraorbital foramina more compressed laterally; inferior lip of foramen magnum less distinctly notched on either side; general outline of skull more compressed anteriorly. Similar to that of *austerus*, but much larger; nasals and palatine slits longer; braincase broader; teeth larger.

Measurements.—Type and one topotype, respectively: Total length, 200; 207; tail vertebræ, 101; 114; hind foot, 24; 24. Average of 10 adults from Mount Rainier, Washington: 203 (194–214); 111 (105–120); 23.2 (22–24); ear from notch (dry) 16.6 (15.9–17.1). Of 12 adults from Neah Bay, Washington: 201 (185–214); 111 (105–123); 22.8 (22–24).

Type specimen.—No. 3696 Museum of Comparative Zoology, formerly same number, Collection of E. A. and O. Bangs. ♀ adult, Aug. 29, 1896. A. C. Brooks. Specimen in good condition.

Remarks.—In length of tail, this form exceeds all other members of the *maniculatus* group. Although the average length is about 110 mm., specimens with tails longer than 120 are common, and an extreme example from Quiniult Lake, Washington, has a tail measuring 131 mm. *P. m. oreas* is not confined strictly to mountainous country, but inhabits also the heavily forested lowlands of the Puget Sound region. Its relationship to *austerus* is difficult to understand. The case is very similar to that of *gambeli* and *rubidus* in California, the complications of which may be due either to hybridization or to intergradation. It is already known that *oreas* and *austerus* occur together at a number of localities and apparently maintain their respective characters. At other places only one form has thus far been found, at others extremes of both forms and intermediates occur, and at still others intermediates only. There is no environmental distinction as in the case of *gambeli* and *rubidus*, for *oreas* and *austerus* live under apparently identical conditions. Although only one form has been found at the respective type localities of *oreas* and *austerus*, both occur together near by and further collecting may show that they do so over a wide area. Specimens which appear to be intermediate between *oreas* and *austerus* may in reality represent special differentiations of the one or the other showing accidental parallelism.

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[a] A single specimen from Tenino, Wash., appears to represent a peculiar pale phase which in worn pelage is pale vinaceous drab. Several like it have been examined from mountains near Wenatchee, and from Lake Kichelos. Others from Tenino and from Easton, near Lake Kichelos, seem to be typical *oreas*.

As stated elsewhere, *oreas* appears to intergrade with *arcticus*, most of the intermediate specimens having been referred to *artemisiae*. It intergrades also with *macrorhinus*, as proved by specimens from River Inlet, British Columbia. Intergradation with *rubidus* also is evident. When intergradation occurs with so many forms even the extremes of which are closely similar in general characters, the allocation of individual specimens or of small series is extremely difficult. Specimens from Lake Bennett and the region of the headwaters of the Yukon, previously referred to *oreas*,[a] prove to be separable and apparently are most closely related to forms of the Alaskan coast. They may be connected with *oreas* through the interior of British Columbia.

Specimens examined.—Total number, 357, from localities as follows:

British Columbia: Chilliwack Valley, 9; Hope and near Hope, 50; Mount Baker Range, 5; Port Moody, 14.

Washington: Aberdeen, 2; Boulder Creek, 20;[b] Boulder Lake, 11;[b] head of Cascade River, 7; Chehalis County, 3; near Lake Cushman, 15; Easton, 7; Granville, 7; Happy Lake, 42;[b] Kent, 1; Kichelos Lake, 6; Lake Washington, 2; Lapush, 19; Martin, 2; Mount Rainier, 29 (Longmire Springs 9, Paradise Creek, altitude 5,200 feet, 11); Mount St. Helens, 2; Mount Vernon, 8; Neah Bay, 49;[c] Quiniult Lake, 15; Roy, 1; Shoalwater Bay, 1; North Fork Skokomish River, 6; Suez, 6; Tenino, 10; 60 miles east of Toledo, 2; near Wenatchee, 6 (aberrant).

PEROMYSCUS MANICULATUS HYLAEUS Osgood.

(Pl. II, fig. 4).

Peromyscus hylaeus Osgood, Proc. Biol. Soc. Wash., XXI, pp. 141–142, June 9, 1908.

Type locality.—Hollis, Kasaan Bay, Prince of Wales Island, Alaska.

Geographic distribution.—Islands and coast of southeast Alaska west and northwest of the range of *P. m. macrorhinus*, including

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[a] North Am. Fauna No. 19, p. 32, Oct., 1900.

[b] May include some specimens of *P. m. austerus*.

[c] Three specimens in this series, although having the large hind foot and long tail of *oreas*, have small skulls very similar to those of *austerus*.

Prince of Wales, Kupreanof, Mitkof, and Admiralty islands and the mainland coast from Lynn Canal to Frederick Sound.

Characters.—Color rich and dark, about as in *macrorhinus;* size decidedly smaller. Similar to *oreas*, but color possibly averaging slightly darker and otherwise differing much as *keeni* does in having smaller ears and shorter tail. Similar to *keeni*, but skull more lightly built; rostrum longer, more slender. Similar to *algidus*, but color darker.

Color.—Practically as in *keeni.* Worn pelage: Sides varying from russet to Mars brown and shading into Mars brown and Prout brown on dorsum.

Skull.—Very similar to that of *oreas;* nasals and rostrum averaging slightly more slender. Similar to that of *keeni*, but more lightly built throughout; rostrum and nasals longer and more slender; posterior nasal endings usually exceeding premaxillæ; infraorbital region lighter. Somewhat similar to that of *macrorhinus*, but decidedly smaller.

Measurements.—Average of 20 adult topotypes: Total length 198.4 (191–205); tail vertebræ 98 (91–105); hind foot 23 (22–23.5); ear from notch (dry) 15.3 (14.5-16.8).

Type specimen.—No. 127038 U. S. National Museum, Biological Survey Collection. ♂ adult. May 15, 1903. W. H. Osgood. Specimen in good condition.

Remarks.—This is the form prevalent over most of the coast region of southern Alaska. In general terms it is like *keeni*, except in cranial characters, and both *keeni* and *hylaeus* are very similar to *oreas* except in respect to their shorter ears and tails. All are decidedly smaller than *macrorhinus* and *sitkensis.* The form from the Queen Charlotte Islands, *keeni*, so far as known, is the only well-developed insular form north of Puget Sound, all those from the various islands of the Alexander Archipelago, with the exception of *sitkensis*, being too slightly or not at all differentiated. *P. m. hylaeus* probably intergrades with *macrorhinus* in the vicinity of Frederick Sound, as indicated by the slightly increased size of specimens from Mitkof Island. Intergradation with *algidus* takes place in the region of Lynn Canal.

Specimens examined.—Total number, 163, from localities as follows:

Alaska: Glacier Bay, 2; Juneau, 10; Kasaan Bay, Prince of Wales Island, 63; near Killisnoo, Admiralty Island, 54; Lindenburg Peninsula, Kupreanof Island, 16; Petersburg, Mitkof Island, 13; Taku Harbor, 5.

PEROMYSCUS MANICULATUS KEENI (RHOADS).

(Pl. II, fig. 8.)

Sitomys keeni Rhoads, Proc. Acad. Nat. Sci. Phila., pp. 258–259, Oct. 23, 1894.
P[eromyscus] keeni Bangs, Am. Naturalist, XXXI, p. 75, Jan., 1897.

Type locality.—Massett, Graham Island, Queen Charlotte Islands, British Columbia.

Geographic distribution.—Moresby and Graham islands, Queen Charlotte Group, British Columbia.

Characters.—Similar to *oreas*, but ears decidedly smaller; tail averaging shorter; skull slightly heavier. Similar to *hylaeus*, but skull heavier, with shorter broader nasals. Size smaller than in *macrorhinus*, *prevostensis*, and *sitkensis*.

Color.—Not appreciably different from that of other forms of the northwest coast—*oreas*, *macrorhinus*, *hylaeus*, etc. Worn pelage: Sides russet shading into darker Mars brown in middle of back. Unworn pelage probably much darker, with dorsum more contrasted with sides.

Skull.—Similar to that of *oreas*, but averaging slightly heavier, particularly in the rostral region. Similar to that of *hylaeus*, but nasals and rostrum shorter and thicker; posterior nasal endings usually about equaling premaxillæ; skull slightly heavier throughout.

Measurements.—Average of 20 males from Skidegate, Graham Island: Total length 197 (186–212); tail vertebræ 102 (95–111); hind foot 22.7 (22–23); ear from notch (dry) 14.7 (14–15.2). Of 15 females from the same locality: 199.8 (181–209); 103.4; 22.4 (22–23).

Type specimen.—No. 7768 Collection Academy of Natural Sciences, Philadelphia; formerly No. 768 Collection of S. N. Rhoads. ♂ young adult. 1892. J. H. Keen. Specimen in alcohol, except skull, which has been removed and preserved separately. It is of little value for comparison.

Remarks.—This mouse is of the same general type as *P. m. oreas* of the Puget Sound region and *P. m. hylaeus* of the islands and coast of southeastern Alaska. It is most closely related to *hylaeus*, being distinguished only by slight cranial characters. Since these characters, although reasonably constant, vary slightly towards *hylaeus*, it seems fitting to include *keeni* among the numerous subspecies of *maniculatus*. The only other white-footed mouse occurring on the Queen Charlotte Islands is *P. s. prevostensis*, which, although nearly the same color, is so much larger than *keeni* as not to require close comparison.

Specimens examined.—Total number 108, from localities in the Queen Charlotte Islands as follows:

Graham Island: Massett, 10; Skidegate Inlet, 50.
Moresby Island: Cumshewa Inlet, 40; near Rose Harbor, 8.

PEROMYSCUS MANICULATUS ALGIDUS[a] subsp. nov.

Type from head of Lake Bennett (site of old Bennett City), British Columbia. No. 130013 U. S. National Museum, Biological Survey Collection. ♂ adult. Sept. 17, 1903. W. H. Osgood.

Geographic distribution.—Region of the headwaters of the Yukon River from Lake Bennett to the lower part of the Lewes River.

Characters.—Similar to *hylaeus*, but color paler and more grayish; similar to *oreas*, but paler and with shorter tail and ears.

Color.—Much as in *arcticus*, but with rather less dusky; similar to *hylaeus* but decidedly paler and more grayish. Unworn pelage: Upperparts between cinnamon and isabella color, mixed with dusky rather lightly on sides and more heavily in middle of back, over quite an area of which it predominates; head and face and sometimes shoulders slightly grayish; orbital ring and dusky spot at base of whiskers present, but less conspicuous than in *hylaeus*. Worn pelage: Sides cinnamon or wood brown to russet, becoming slightly darker on dorsum; dusky mixture seldom or never thoroughly eliminated; ears rather broadly edged with whitish; pre-auricular lanuginous tufts usually with a few white hairs.

Skull.—Very similar to those of *oreas* and *hylaeus;* possibly averaging slightly larger; larger than in *arcticus*, with larger teeth and zygomata more compressed anteriorly.

Measurements.—Average of 20 adult topotypes: Total length 192 (178–204); tail vertebræ 94 (83–101); hind foot 22.5 (22–23.5); ear from notch (dry) 15.8 (15–16.4).

Remarks.—This is a slight form, the interior representative of the dark coast form *hylaeus*. It is very similar to *oreas*, differing only in slightly paler color and in shorter tail and ears. Possibly the two intergrade in the interior of northern and central British Columbia. Although *arcticus* and *oreas* appear to intergrade in southern British Columbia, *arcticus* and *algidus* occur together in the range of *algidus* and maintain their distinctness. Although nearly the same color, they are easily distinguishable by size and cranial characters. In the flesh, their distinctness is even more apparent. This form as well as *oreas* bears some general resemblance to *gracilis*, the long-tailed form of the East. All the similar western forms, however, regardless of color or length of tail, differ from *gracilis* in larger hind feet and in larger skulls with heavier teeth.

Specimens examined.—Total number 66, from localities as follows:

Alaska: Glacier, White Pass Railroad, 11; Haines, 1 (approaching *hylaeus*); Skagway, 1; Summit, White Pass, 1.

British Columbia: Bennett, 41; Cheonnee Mountains, 1.

Yukon Territory: Caribou, 2; Fifty Mile River, 1; Lake Tagish, 4; White Horse, 3.

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[a] *Algidus* = very cold, pertaining to a cold climate.

PEROMYSCUS MANICULATUS MACRORHINUS (RHOADS).

Sitomys macrorhinus Rhoads, Proc. Acad. Nat. Sci. Phila., pp. 259–260, Oct. 23, 1894.

P[eromyscus] macrorhinus Bangs, Am. Naturalist, XXXI, p. 75, Jan., 1897.

Type locality.—North Pacific Salmon Cannery,[a] mouth of Skeena River, British Columbia.

Geographic distribution.—Mainland coast of northern British Columbia and southern Alaska.

Characters.—Size very large (hind foot 24–25); color dark and rich. Similar to *oreas*, but decidedly larger; tail relatively shorter. Similar to *hylaeus*, but larger throughout. Similar to *sitkensis*, but smaller, skull decidedly smaller and more slender.

Color.—Almost as in *oreas*, possibly averaging slightly darker. Worn pelage:[b] Sides varying from rich russet to Mars brown; middle of back slightly darker, approaching Prout brown and burnt umber; orbital ring and spot at base of whiskers rather extensive and contrasted (probably more so in unworn pelage); 'ankles' broadly dusky brownish behind, foreleg with a russet stripe extending from side nearly or quite to wrist; underparts creamy white.[c]

Skull.—Similar to that of *oreas* and *hylaeus*, but decidedly larger; nasals more elongate; molariform teeth larger; zygomata more compressed anteriorly. Similar to that of *sitkensis*, but smaller; rostrum more slender; molariform teeth smaller; audital bullae relatively larger.

Measurements.—Average of 6 adults from Inverness, mouth of Skeena River, British Columbia: Total length 209 (200–217); tail vertebræ 112 (105–117); hind foot 24.5 (24–25); ear from notch (dry) 16.1 (15–17). Average of 10 adults from Wrangell, Alaska: 215 (202–222); 112 (104–123); 23.8 (23–24.5).

Type specimen.—No. 8381 Collection Academy of Natural Sciences, Philadelphia. Formerly No. 1381 Collection of S. N. Rhoads. Collected by J. H. Keen. Skin in alcohol. Skull not thoroughly cleaned; right zygoma and part of infraorbital plate broken away; otherwise in good condition.

Remarks.—The mice of the northwest coast, including *oreas*, *macrorhinus*, *hylaeus*, *sitkensis*, and *keeni*, are very similar in color, and the various forms are distinguishable only by size, proportions, and slight cranial characters. With the exception of *sitkensis* and *prevostensis*, *macrorhinus* is the largest of these northwest coast forms. Since *sitkensis* and *prevostensis* are insular in distribution so far as known, *macrorhinus* is the only very large mainland form. Its size readily distinguishes it from *oreas* and *hylaeus*, though indications of intergradation with each are known, and specimens from outlying localities therefore may prove troublesome. A series from River Inlet, British Columbia, seems to show intergradation between *macrorhinus* and *oreas*, containing, as it does, individuals which may be referred without violence to either one, and others that are as nearly halfway between the two as conceivable. Another series from Petersburg, Alaska, though referable to *hylaeus*, have somewhat larger teeth than that form and may be considered as connecting *hylaeus* with *macrorhinus*. Thus it appears that the type locality of *macrorhinus* is in about the center of its range, a most unusual circumstance, for when it was described absolutely nothing was known of the distribution and relationships of the mice of the northwest coast and the type locality was determined only by the location of the first collector to secure specimens and forward them to a mammalogist.

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[a] The exact locality, as I am informed by Rev. J. H. Keen, who collected the type.

[b] Specimens in complete unworn pelage are not at hand. As indicated by a few specimens in changing pelage, it would be very nearly the same as in *oreas* and *hylaeus*.

[c] One specimen from Inverness, British Columbia, is abnormally colored. The entire underparts are rich brownish russet like the sides; the underside of the tail is flecked with dusky; and the feet are brownish dusky to the bases of the toes. Thus the only white on the animal is on its toes.

Specimens examined.—Total number 111, from localities as follows:

Alaska: Loring, Revillagigedo Island, 34; Woronkofski Island, 6; Wrangell, 33.

British Columbia: Metlakatla, 4;[a] Port Simpson, 3; River Inlet, 22 (approaching *oreas*); mouth of Skeena River, 9 (Inverness, 8; North Pacific, 1).

PEROMYSCUS MANICULATUS ARTEMISIAE (RHOADS).

Sitomys americanus artemisiae Rhoads, Proc. Acad. Nat. Sci. Philadelphia, pp. 260–261, Oct. 23, 1894.

Peromyscus texanus subarcticus Allen, Bull. Am. Mus. Nat. Hist., N. Y., XII, pp. 15–16, Mar. 4, 1899—Deerlodge County, Mont.[b]

Peromyscus texanus artemisiae Miller and Rehn, Proc. Bost. Soc. Nat. Hist., XXX, p. 84, Dec., 1901.

Type locality.—Ashcroft, British Columbia.

Geographic distribution.—South central British Columbia, northeastern Washington, northern Idaho, western Montana, and western Wyoming. Transition and Canadian zones.

Characters.—More or less similar to *arcticus*, *rufinus*, and *gambeli;* size about as in *arcticus*, color somewhat paler, skull narrower; color about as in *gambeli*, though slightly darker, size larger; color less tawny and size larger than in *rufinus;* white in subauricular tufts nearly obsolete; tail shorter and color paler than in *oreas;* darker and larger than *nebrascensis* and *sonoriensis.*

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[a] Collection of Canadian Geological Survey.

[b] The exact locality is "SW. corner of Deerlodge Co.—about 20 miles west and a very little north of Anaconda—near a Post Office called Cable," as I am informed by a letter from the collector, Prof. L. L. Dyche.

Color.—Ground color of upperparts varying from pale cinnamon to brownish fawn, about as in *gambeli*, duller and less tawny than in *rufinus;* dusky mixture usually somewhat concentrated on dorsum into an irregular darker area; ears dusky, whitish edged; subauricular tufts, when conspicuous, chiefly buffy cinnamon, lightly mixed with dusky, white much reduced or absent; a dusky spot at base of whiskers; eyelids and sometimes a very narrow orbital ring dusky; feet white; forelegs white or often with a light mixture of dusky to wrists; 'ankles' dusky; underparts creamy white; tail dark brownish above, white below. Worn pelage: General color rather dull; sides pale fawn to russet; dorsum russet to Prout brown. Adolescent pelage: Ground color pale drabby fawn heavily mixed with dusky, slightly increased on dorsum; general effect of upperparts broccoli brown to hair brown. Young in first coat: Base of hairs slate color to blackish slate; general effect of upperparts mouse gray, decidedly darker and more slaty on dorsum.

Skull.—Much as in *rufinus* and *gambeli*, but averaging larger and more elongate with longer nasals; similar to that of *arcticus*, but averaging narrower with less spreading zygomata and longer more slender nasals.

Measurements.—Average of 6 topotypes: Total length 167 (155–180); tail vertebræ 75 (69–86); hind foot 20.5 (19–22); ear from notch (dry) 16.1 (15–17). Of 5 adults from Similkameen River: 172 (158–186); 77.5 (68–82); 20.2 (20–21).

Type specimen.—No. 7368 Collection of Academy of Natural Sciences, Philadelphia. Formerly No. 368 Collection of S. N. Rhoads. ♂ adult. July 5, 1892. S. N. Rhoads. A flat skin without stuffing, but otherwise in good condition; tail stiffened with a quill; skull practically perfect.

Remarks.—It is extremely difficult to characterize this form since it shows some resemblance to so many surrounding forms. It seems to be an aggregation of intermediates, but sufficiently constant and restricted in range to merit recognition. Its recognition as a distinct form is far more satisfactory than an attempt to adjust it with the several related forms, with none of which it thoroughly agrees. In a way, it connects the long-tailed and the short-tailed forms of the *maniculatus* group, although intergradation between the two series occurs also elsewhere. The gradation from *gambeli* via *artemisiae* to *oreas* seems to be complete, although at certain localities representatives of each may be found apparently preserving distinctness. At St. Mary Lake, Montana, two forms occur, one referable to *nebrascensis* and occupying the open sagebrush country, and the other, called *artemisiae*, being confined to the heavy forest. Although distinct here and apparently free from hybridization, each form is connected by slight gradations with the same parent (?) form. The majority of the series called *artemisiae* are indistinguishable from topotypes except by size, and in this respect variation in the series extends from the average dimensions of *artemisiae* to those of *oreas*. The closest relations of *artemisiae* are with *arcticus*, and some specimens are almost indistinguishable. Additional material from central and northern British Columbia, western Montana, northern Idaho, and adjacent regions, supplemented by careful field studies, would doubtless reveal some very interesting facts regarding intergradation and distribution, and it may be necessary later for *artemisiae* and *arcticus* to be thrown together; for the present both may be recognized. *P. m. artemisiae* intergrades even with *sonoriensis*, as proved by specimens from east-central Idaho, and these in turn merge with *nebrascensis*, *rufinus*, *gambeli*, etc., and so connection with all the forms of this remarkable group is shown. *P. subarcticus* Allen is an absolute synonym of *artemisiae*, the type being indistinguishable in even the slightest degree from topotypes of *artemisiae*.

Specimens examined.—Total number 549, from localities as follows:

British Columbia: Ashcroft, 28; Barkerville, 1; Bonaparte, 1; Ducks, 2; Field, 16 (approaching *oreas* and *arcticus*); Glacier, 6 (approaching *oreas* and *arcticus*); Gold Range, 1; Golden, 8 (approaching *oreas* and *arcticus*); Hope and near Hope, 87; 125 Mile House, Cariboo Road, 2; Kamloops, 15;[a] Lac La Hache, 2;[b] Midland, 1;[a] Moniskee Divide, 15; Myer Creek, 2;[a] Nelson, 18; Okanagan, 14;[a] Okanagan Lake, 3; Rossland, 1;[a] Shuswap, 3; Sicamous, 13 (approaching *oreas*); Similkameen River, 5 miles north of U. S. boundary, 7; Sophia Mountains, 1;[a] Spences Bridge, 2;[a] Vernon, 6.

Idaho: Bitter Root Mountains, 1; Cœur d'Alene, 19; near Collins, Latah County, 2; Craig Mountains, 1; Fiddle Creek, 4; Freedom, 1; Kingston, 2; Mission, 1; Mullan, 8; Osborn, 3; Priest Lake, 8 (approaching *oreas*); Seven Devils Mountains, 3.

Montana: Beartooth Lake, 6; Beartooth Mountains, 2; Deerlodge County, 3; Flathead Lake, 13; Helena, 2; Horse Plains, 3; Hot Springs Creek, 1; Kalispell, 1; Little Bitter Root Creek, 3; Lolo, 5; Nyack, 7; Prospect Creek, 5; St. Mary Lake, 10 (approaching *oreas*); Saltese, 10; Stanton Lake, 1; Stephensville, 4; Summit, 2; Thompson Falls, 1; Thompson Pass, 4; Tobacco Plains, 11; Upper Stillwater Lake, 1.

Oregon: Elgin, 3 (approaching *gambeli*); Wallowa Lake, 14 (approaching *gambeli*); Wallowa Mountains, 1.

Washington: Asotin, 2 (approaching *gambeli*); Blue Creek, 5; Cheney, 2; Columbia River (Lord), 1; Colville, 15; Conconully, 3; Crab Creek, Lincoln County, 1 (approaching *gambeli*); Davenport, 1;

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[a] Collection Canadian Geological Survey.

[b] Specimens poor, position doubtful.

Douglas, 1; Easton, 2; Fort Spokane, 2; Marcus, 4; Rock Lake, 2; Spokane Bridge, 15; Spokane Falls, 1; Wawawai, 2 (approaching *gambeli*).

Wyoming:[a] Baggs Crossing (30 mi. NW.), 8; Clarks Fork, 9; Jacksons Hole, 1: La Barge Creek, 3; Lake City, 10; Mammoth Hot Springs, 34; Yellowstone Park, 4.

PEROMYSCUS MANICULATUS SATURATUS Bangs.

Peromyscus texanus saturatus Bangs, Am. Naturalist, XXXI, pp. 74–75, Jan. 1, 1897.

Type locality.—Saturna Island, Island District, British Columbia.

Geographic distribution.—Confined to Saturna Island.

Characters.—Similar in color to *P. m. austerus*, but lateral line and cinnamon beneath base of tail more conspicuous; size larger; skull larger, broader, and more angular; hind foot 21 to 22; tail shorter than head and body.

Color.—Unworn or slightly worn pelage: Upperparts very dark; general effect cinnamon heavily clouded with blackish, the latter somewhat concentrated dorsally; lateral line cinnamon, rather well defined, extending to the heels, which are mixed cinnamon and dusky, and broadening across the interfemoral region beneath the tail into a conspicuous patch of nearly clear cinnamon; upper side of arm to wrist cinnamon lightly mixed with dusky; ears dusky brownish, edged with whitish, subauricular tufts same color as rest of upperparts; tail blackish brown above, white below; underparts creamy white not thoroughly concealing slaty undercolor. Worn pelage: Sides bright cinnamon to russet, blending with the lateral line which is much less contrasted than in unworn pelage; back dark, Mars brown to mummy brown and Prout brown. Adolescent pelage: Sides drabby hair brown or sooty isabella color; narrow cinnamon lateral line usually well marked; back with a rather well-defined sooty grayish brown stripe.

Skull.—About the size of that of *oreas* but more angular and more arched in the interorbital region; larger, broader, and more angular than in *austerus;* audital bullæ and molar teeth about as in *oreas*, slightly larger than in *austerus*.

Measurements.—Average of 10 adults from the type locality (fide Bangs, l. c.): Total length 180.9; tail vertebræ 76.2; hind foot (dry) 21.25.

Type specimen.—No. 2581 Museum of Comparative Zoology, Cambridge, Mass., formerly same number Collection of E. A. and O. Bangs. ♂ adult, January 31, 1894. W. C. Colt. Specimen in fair condition. Skull with nasals slightly broken anteriorly; otherwise perfect.

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[a] All approaching *rufinus*.

Remarks.—Although typical *austerus* occurs on both sides of Puget Sound and even on Vancouver Island, it does not appear to range unchanged over the small islands between Vancouver Island and the mainland. The form of Saturna Island will perhaps be found on adjacent islands and may be connected by them with *austerus*. Certain aberrant specimens from the mainland at Howe Sound and Malaspina Inlet, British Columbia, show some approach to *saturatus*, particularly in their skulls, but for the present seem best considered as variously intermediate between the mainland forms.

Specimens examined.—Total number 221, all from the type locality.

PEROMYSCUS MANICULATUS HOLLISTERI subsp. nov.

(Pl. II, fig. 6.)

Type from Friday Harbor, San Juan Island, San Juan County, Wash. No. 130316 U. S. National Museum, Biological Survey Collection. ♂ adult, Oct. 23, 1903. N. Hollister.

Characters.—Color almost as in *saturatus;* skull larger and heavier, with larger molar teeth, and larger audital bullæ.

Color.—Almost as in *saturatus;* ground color a slightly paler shade of cinnamon; lateral line not so sharply defined.

Skull.—Similar to that of *saturatus*, but larger and heavier; palate broader, molar teeth heavier; audital bullæ actually and relatively larger.

Measurements.—Average of 10 adult topotypes: Total length 180.8 (167–188); tail vertebræ 79.3 (73–84); hind foot 22.1 (21–22.5); ear from notch (dry) 16.8 (15.2–17.2).

Remarks.—The relationship of this form to *saturatus* is evident. The cranial characters by which it differs are constant, and it seems necessary to recognize them, especially since it is an insular form. The evident deviation of both *saturatus* and *hollisteri* from mainland forms of the *maniculatus* series seems best expressed by trinomial names, particularly since so many of the small islands of the Puget Sound region are as yet unrepresented by specimens in collections. The whole question of the interrelations of *oreas*, *austerus*, and *artemisiae* is not as yet satisfactorily worked out, and much material and careful field notes from islands and mainland coasts of southern British Columbia and northern Washington are greatly to be desired.

Specimens examined.—Total number 41, all from the type locality.

PEROMYSCUS MANICULATUS AUSTERUS (BAIRD).

(Pl. II, fig. 3.)

Hesperomys austerus Baird, Proc. Acad. Nat. Sci. Phila., VII, p. 336, 1855.
P[eromyscus] austerus Bangs, Am. Naturalist, XXXI, p. 75, Jan., 1897.
Peromyscus akeleyi Elliot, Field Col. Mus., Chicago, Zool. Ser. I, p. 226, Feb., 1899—Elwah River, Olympic Mountains, Washington.

Type locality.—Old Fort Steilacoom, Wash.

Geographic distribution.—Coast region of Puget Sound, Washington; north to southern British Columbia and including Vancouver Island.

Characters.—Size medium (hind foot 19–22, tail usually less than 100); color very dark. Similar to *oreas*, but decidedly smaller and more sooty in color; similar to *saturatus* and *rubidus*, but skull smaller and narrower; similar to *gambeli*, but very much darker and with different skull.

Color.—Unworn pelage: Ground color of upperparts brownish fawn; sides with liberal mixture of sooty, middle of back with still more, forming a more or less distinct sooty stripe; ears sooty, very narrowly edged with whitish, no white at anterior bases; a narrow dusky orbital ring and a small dusky spot at base of whiskers; underparts creamy white, slaty undercolor usually showing through; tail sooty above, white below; 'ankles' dusky brownish. Worn pelage: Sides Mars brown to Prout brown; dorsum Prout brown to mummy brown. Adolescent pelage: Sides grayish wood brown heavily mixed with sooty, middle of back and top of head black or nearly black, shoulders slightly less intense.

Skull.—Size small; braincase very narrow; nasals rather short; zygomata not 'squared' anteriorly; molariform teeth small; palatine slits short. Most similar to that of *gambeli*, but narrower and more elongate; zygomata lighter; decidedly smaller than in *saturatus*, *oreas*, and *rubidus*.

Measurements.—Average of 10 topotypes: Total length 172 (163–190); tail vertebræ 86 (79–96); hind foot 20.5 (20–21); ear from notch (dry) 15 (14–15.5). Of 10 adults from Goldstream, Vancouver Island, British Columbia: 173 (170–178); 85 (81–89); 20.3 (19–21).

Type specimen.—In the original description of *austerus*, Baird does not designate a type but mentions two localities, thus: "Collected at Fort Steilacoom, Puget Sound, by Dr. Geo. Suckley, U. S. A., and by Dr. Cooper on the Spokan Plains." In 1857, two years later, he published a more complete description and listed 1 specimen from Spokane Plain and 11 from Steilacoom, 4 of the latter queried and mentioned in the text as possibly belonging to another form (Mamm. N. Am., p. 466, 1857). Allen (Bull. Am. Mus. Nat. Hist., V, p. 192, 1893) has selected Steilacoom as the type locality of *austerus* on the grounds that it is the locality first mentioned in the original description and the one from which came the majority of the specimens examined by Baird in 1857. Miller and Rehn (Proc. Bost. Soc. Nat. Hist., XXX, p. 69, Dec., 1901), either unaware of Allen's action or in exception to it, gave Spokane Plain as the type locality. There appear to be good grounds for either decision, but Allen's, having priority, is entitled to more consideration even though it can not be denied that the specimen from Spokane Plain may have been the chief basis of the original description. The statement by Baird (Mamm. N. Am., p. 466) that "the *Hesperomys austerus* has thus far only been found in the eastern part of Washington Territory" is hard to understand in connection with the list of specimens immediately following, the majority of which are from western rather than eastern Washington. No. 1964, U. S. National Museum, from Steilacoom, which is one of the specimens listed in 1857 now extant, was considered the type by Coues, and now bears a type label, but as it was not collected until 1856, the year following the first publication of the name, and as its measurements do not agree with those of the original description, obviously it can not logically be considered the type. The measurements given in the original description do not agree exactly with those of the specimen from Spokane Plain as published by Baird in 1857, nor yet with any of those from Steilacoom, so no conclusion can be adduced from that source. On the whole, the question appears to be open, and therefore Allen's right to fix Steilacoom as the type locality can not fairly be disputed.

Of Baird's original specimens from Steilacoom now extant, No. 364 U. S. National Museum (skull only) may perhaps be regarded as the type. It is badly broken and of little value for comparison (see Lyon and Osgood, Bull. U. S. Nat. Mus. No. 62, p. 125, 1909).

Remarks.—Typical *austerus* appears to be confined to the immediate vicinity of Puget Sound. Specimens from Howe Sound and Malaspina Inlet on the coast of southern British Columbia are slightly large, but do not seem separable. In cranial characters some of them approach *oreas* very closely, but others are exactly like *austerus;* since the majority have skulls more similar to *austerus* and all have rather short tails and hind feet, they are referred to *austerus.* In the same way, specimens from Lake Cushman and the Skokomish River in the eastern Olympic Mountains are larger than typical; these, however, may possibly be tending toward *rubidus.* The series representing '*P. akeleyi*' also comes within this category. The type, however, is like *austerus* in size and cranial characters. Specimens from Vancouver Island are almost exactly like topotypes, differing only in having slightly wider braincases. Some specimens from the coast of Oregon approach *austerus* quite decidedly, but the general average of the majority from that region seem referable to *rubidus,* chiefly on account of their larger, broader skulls. The occurrence of *austerus* and *oreas* at the same localities has been discussed in the account of *oreas.*

Specimens examined.—Total number 408, from localities as follows:

British Columbia: Agassiz, 10; Comox, 6; Chilliwack Valley 11; Gibson Landing, Howe Sound, 12;[a] Goldstream, 27; Hastings 3; Kent, 2; Langley, 1; Lund, Malaspina Inlet, 20;[a] Mount Baker Range, 1; Mount Lehman, 1; Port Moody, 14; Salt Spring Island, 2;[a] Sumas, 22; Victoria, 26;[b] Wellington, 3; Westminster, 9.

Washington: Aberdeen, 9;[a] Avon, 5; Boulder Creek, 30;[c] Boulder Lake, 1; Elwah River, Olympic Mountains, 38;[c] Lake Cushman, 1; Hamilton, 3; Happy Lake, 2; Johnson Ranch, Elwah River, 2; Mount Ellinor (3 m. SE.), 2; Mount Vernon, 28; Nesqually Flats, 31; Roy, 1; Sauk, 2; Seattle, 9; North Fork Skokomish River, 21; Soleduck River, 1;[a] Steilacoom, 40; Tacoma, 3; Tenino, 3; Whidby Island, 6.

PEROMYSCUS MANICULATUS RUBIDUS Osgood.

Peromyscus oreas rubidus Osgood, Proc. Biol. Soc. Wash., XIV, pp. 193–194, Dec. 12, 1901.

Peromyscus perimekurus Elliot, Field Col. Mus., Chicago, Pub. 74, Zool. Ser., III, p. 156, Apr., 1903—Goldbeach, Oreg.

Type locality.—Mendocino City, Calif.

Geographic distribution.—Coast of California and Oregon from San Francisco Bay to the mouth of the Columbia River.

Characters.—Similar to *oreas*, but tail and hind foot shorter; similar to *austerus*, but color paler, skull larger and broader; similar to *gambeli*, but tail longer and color darker.

Color.—Unworn pelage: Ground color of upperparts cinnamon; black mixture rather heavy on sides, predominating on back, forming a broad blackish stripe from shoulders to base of tail or an irregular patch between shoulders and rump; head and shoulders somewhat grayish; a conspicuous blackish orbital ring and spot at base of whiskers; ears dusky, edged with whitish; very few or not any white hairs at anterior bases of ears; feet white, 'ankles' dusky; tail blackish above, white below; underparts creamy white. Worn pelage: Sides fawn color to russet; dorsum russet to Mars brown; face and head nearly like sides; dusky mixture often almost entirely eliminated or so faded as to show scarcely any contrast with ground color. Adolescent pelage: General effect of upperparts varying from grayish hair brown to hair brown tinged with fawn. Young in first coat: General color mouse gray, more or less sooty in middle of back.

Skull.—Similar to that of *gambeli*, but larger and heavier; similar to that of *oreas*, but with nasals averaging slightly shorter; somewhat similar to that of *austerus*, but decidedly larger and heavier, braincase broader, teeth heavier.

Measurements.—Three adult topotypes: Total length, 189, 190, 203; tail vertebræ, 99, 95, 99; hind foot, 21, 22, 21. Average of 6 adults from Mendocino County, Calif., 193 (189–203), 96 (90–100), 21.5 (21–22), ear from notch (dry), 15.8 (15.2–16.9).

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[a] Approaching *oreas*?

[b] Collection of Canadian Geological Survey.

[c] May include some specimens of *P. m. oreas*.

Type specimen.—No. 91650 U. S. National Museum, Biological Survey Collection. ♀ adult. November 17, 1897. J. Alden Loring. Specimen in good condition.

Remarks.—The range of this form follows quite closely the humid coast belt of California and Oregon. Specimens from the southern part of its range approach *gambeli*, and in the north, near the mouth of the Columbia River, approach to *oreas* or *austerus* or both is evident. Some series from this latter region are too variable to admit of satisfactory classification, for they contain individuals showing some of the characters of any of the three closely related forms, *oreas*, *austerus*, and *rubidus*. The difficulty is increased by two names, *akeleyi* and *perimekurus*, which confront the reviser. Their respective types do not exactly agree with any of the other forms, and series from their type localities contain large and small, dark and light individuals. Neither form can be definitely characterized, and the soundest procedure seems to be to consign each to the form which appears to be dominant in the region from which it comes. Thus *akeleyi* falls under *austerus* and *perimekurus* under *rubidus*. Specimens from the Willamette Valley are nearly typical, though possibly tending in slight degree toward *gambeli*. All along the border between the humid coast and the relatively arid interior are found intermediates between *rubidus* and *gambeli*, or in some localities the two forms are found side by side. Six specimens from the Outer Peninsula, near Samoa, Humboldt Bay, are decidedly paler than others from the neighboring redwoods. They evidently represent an incipient and very local subspecies, and well illustrate the plasticity of the group to which they belong. A careful study of this variation and the local conditions doubtless would prove instructive. An aberrant specimen is present also in the series from Wells, Oreg. It is so much paler than the others of the series that partial albinism is suggested, but possibly local environment may be the true explanation.

Specimens examined.—Total number 838, from localities as follows:

California: Alton, 11; Alton Junction, 8; Berger Creek, 4; Blue Lakes, 1; Bodega, 10; Briceland, 4; Cahto, 17; near Calpella, 2; Camp Meeker, 1; Canyon Creek, Trinity County, 1; Cape Mendocino, 2; Cazadero, 1; Crescent City, 51; Dyerville, 7; Eureka, 15: Freestone, 2; Gasquet, 8; Hoopa Valley, 18; Humboldt Bay, 19 (Carson Camp, Mad River, 13; Outer Peninsula, near Samoa, 6[a]); Inverness, 8; La Honda, 46; Laytonville, 1; near Lower Lake, 18; Mad River, 2; Marshall, Marin County, 5;[a] Mendocino City, 15; Mount Tamalpais, 1; Nicasio, 67; Novato, 2; Olema, 6;[a] Orick, 21; Petrolia, 10; Point Reyes, 38;[a] Portola, 160;[a] Requa, 18; Rio Dell, 1; Rockport, 2; Sherwoods, 15; Siskiyou Mountains (Shelley Creek), 3; Smith River, 4; Sur, 10;[a] Ukiah, 11;[a] Westport, 1; Woodside, 2.[a]

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[a] Aberrant.

Oregon: Agnes, 2; Astoria, 12; Beaverton, 1; Elkhead, 1; Florence, 7; Forest Grove, 1; Gardiner, 22; Glendale, 1; Gold Beach, 17; Grants Pass, 5;[a] Marshfield, 3; McCoy, 9; Mount Hood (west slope), 1; Oregon City, 5; Portland, 22; Port Orford, 2; Prospect, 12;[a] Riddle, 1; Rogue River Valley, 2;[a] Roseburg, 5;[a] Scottsburg, 6; Seaside, 15; Sheridan, 6; Tillamook, 1; Wells, 20; Yaquina, 6; Yaquina Bay, 4.

PEROMYSCUS MANICULATUS GAMBELI (BAIRD).

(Pl. II, fig. 12.)

Hesperomys gambelii Baird, Mamm. N. Am., Pac. R. R. Reports, VIII, pp. 464–465, 1857.

Sitomys americanus gambelii Allen, Bull. Am. Mus. Nat. Hist., N. Y., V, pp. 190–191, Aug. 18, 1893.

Sitomys americanus thurberi Allen, *supra cit.*, pp. 185–186—San Pedro Martir Mountains, Lower California.

P [*eromyscus*] *t*[*exanus*] *gambelii* Mearns, Proc. U. S. Nat. Mus., XVIII, p. 446, Mar. 25, 1896.

Peromyscus texanus medius Mearns, Proc. U. S. Nat. Mus., XVIII, p. 446, Mar. 25, 1896—Nachoguero Valley, Lower California.

Type locality.—Monterey, Calif.

Geographic distribution.—Central Washington east of the Cascades, thence south through central and eastern Oregon to California; throughout California except the 'redwood strip' of the northwest coast and except the southeastern desert region and the region east of the Sierra; south into northwestern Lower California. Upper Sonoran to Hudsonian zone.

Characters.—General characters similar to *rufinus*, *sonoriensis*, and *artemisiae;* color much as in *rufinus*, but usually duller, less tawny; decidedly darker, more clouded with dusky than in *sonoriensis;* size smaller than in *artemisiae;* also slightly smaller than *sonoriensis;* somewhat dimorphic in color, but with one phase greatly predominating; somewhat similar to *rubidus*, but smaller, with shorter tail and less intense color.

Color.—Buff phase[b] in unworn pelage: Upperparts between ochraceous and ochraceous buff heavily and nearly uniformly mixed with dusky, producing a general effect varying from rusty isabella color to bister; sides nearly or quite like back; underparts creamy white; ears dusky, narrowly edged with whitish; subauricular tufts same color as back, white spots nearly or quite obsolete; no definite dusky facial markings; feet white, 'ankles' slightly dusky or nearly white; tail bicolor, dusky brownish above, white below. Dark phase: Rather variable, but in general more dusky and more vinaceous than buff phase; general effect Mars brown strongly tinged with fawn. Worn pelage: General effect of upperparts varying from clay color or dingy ochraceous buff to lightly grizzled fawn color, dusky mixture changed to cinnamon or brownish, but seldom so thoroughly eliminated as in *sonoriensis;* sides usually nearly the same as back. Adolescent pelage: General effect of upperparts varying from hair brown to sepia, dusky mixture often very strong. Young in first coat: Bases of hairs slate color or blackish slate, tips mouse gray, usually slightly darker on back than on sides; general effect grayish slate color.

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[a] Approaching *gambeli.*

[b] The predominating phase, and though not so distinctly buffy as the buff phases of *sonoriensis* and *blandus*, it is evidently the corresponding condition.

Skull.—Practically as in *sonoriensis* but averaging slightly smaller; smaller and with shorter nasals than in *artemisiae;* decidedly smaller than in *rubidus*, with smaller teeth, smaller and narrower braincase, and shorter, relatively broader, nasals.

Measurements.—Average of 6 adult topotypes: Total length 159 (148–170); tail vertebræ 71.6 (64–80); hind foot 20; ear from notch (dry) 14.9 (14.2–15.8). Of 10 adults from Stanford University, California: 161 (157–173); 72.4 (70–77); 20. Of 10 adults from northwestern Lower California: 170 (160–183); 80 (69–86); 20.7 (20–21.7).

Type specimen.—An individual type was not specified by Baird. His list of specimens with the original description includes various localities in Washington, Oregon, and California. Since the list appears to follow a geographic sequence from north to south, the specimens from Washington are mentioned first. It is evident, however, that the specimens from California formed the principal basis of the description. One from Monterey, Calif. (No. 369), is specifically mentioned in the description, and farther on the form is referred to as "the common California species." Doctor Allen, therefore, in 1893 (l. c.), designated this specimen (No. 369 U. S. National Museum) as the type of *gambeli.* It is not now extant, but a so-called cotype, No. 368, is in the National Museum. It is in very bad condition, having been exposed as a mounted specimen until the color has faded very much. The present color is chiefly pale yellowish buff. The ears are entirely gone and patches of hair are gone from the sides. The skull has been removed from the skin and is in good condition.

Remarks.—*P. m. gambeli* is one of the most widely ranging and best known of the *maniculatus* group. It is extremely abundant throughout its range, and large representations of it are present in most American collections. It is quite variable and its intergradation with surrounding forms is complete. Since it stands between *sonoriensis* and the paler shorter-tailed forms of the group on the one hand and *rubidus* and the darker longer-tailed forms on the other, it necessarily includes a considerable range of variation. That is, intermediates between *gambeli* and *sonoriensis* must be quite different from intermediates between *gambeli* and *rubidus*, although both are referable to *gambeli* because nearer to that than to the other forms. For example, specimens from Berkeley, Calif., are darker and longer-tailed than typical *gambeli* and evidently approach *rubidus;* while others from Jacumba, Calif., are paler than *gambeli* and approach *sonoriensis*. The Berkeley specimens are therefore decidedly darker than those from Jacumba, but they are nearer to *gambeli* than to *rubidus*, and those from Jacumba likewise nearer than to *sonoriensis*. In studying such material, there is constant temptation to treat these intergrades as separate forms, but after testing every possible alternative one is forced to conclude that no logical subdivision of *gambeli* as here recognized can be made. When the problem is viewed as a whole—in perspective, so to speak—*gambeli* appears to be a tolerably constant entity throughout what may be called the center of its range and about the periphery to merge with other forms. Thus, specimens from Monterey, the type locality, are absolutely identical with those from San Diego and the northeast coast of Lower California, and the intervening region is inhabited by exactly the same form. These, moreover, are like specimens from the greater part of the interior of California, including the west slope of the Sierra. Whenever this constant form meets the range of *sonoriensis*, however, the effect is immediately apparent, and throughout a narrow strip between the ranges of the two forms intermediates or mixed specimens fairly representative of each form are found. Thus intermediates between *gambeli* and *sonoriensis* are similar, whether from the San Pedro Martir Mountains of Lower California or from the eastern slopes of the northern Sierras or Cascades. As Monterey, the type locality of *gambeli*, is on the coast not far from San Francisco Bay, it might be supposed that topotypes would be nearer to the darker form *rubidus* than to the animal of the coast ranges of southern California. This is not the case, however, and the reason is easily understood when the local conditions are known. At Monterey it is dry and sandy, and these conditions continue inland to the Salinas Valley. Although specimens from the Santa Cruz Mountains on one side of Monterey Bay and from Sur on the other are referred to *rubidus*, those from the vicinity of the town of Monterey are like those from Salinas and other interior localities.

The transition from *gambeli* to *rubidus* along the line between their ranges is rather sudden, suggesting the possibility of hybridizing. From several localities specimens fairly typical of both forms are known, from others we have both forms and apparent intermediates, and from still others all specimens thus far obtained are intermediates not typical of either form. This is exactly what would be expected upon the theory of hybridism, but of course it can not be considered as conclusive proof. Specimens from the higher parts of the Sierra appear to differ in an extremely slight degree from the coast range specimens and apparently approach *rufinus*. The amount of individual variation is so great, however, that there seems to be no means of distinguishing the mountain specimens. In fact, even *gambeli* from the region of the type locality differs but little from *rufinus*. Specimens slightly darker or lighter than the average may be found almost anywhere in the range, as the animal seems to respond to local environment very readily. Thus specimens caught in thick woods along a comparatively cold stream may be noticeably darker than others taken perhaps within half a mile in the chaparral of a dry hillside. It is possible that the first generation of progeny from the darker specimens if transferred to the dry hillside would be lighter than their parents. Such questions, of course, can be determined only by experimentation, but obviously variations that occur fortuitously throughout wide areas can not be distinguished by name. In spite of this frequent variability *gambeli* is not a respecter of zones, as appears in many localities, notably on Mount Shasta, where it ranges unchanged from the base of the mountain to the rocky cliffs above timberline. In northeastern California the mice of the semidesert lava beds are more like the dark *gambeli* than the pale *sonoriensis*. Throughout the desert region *sonoriensis* is the prevailing form, except on the lava beds. Apparently the animals inhabiting lava beds differ from those of the wooded Sierra in the causes of their acquiring their dark color, but since they are indistinguishable they must be referred to *gambeli*.

Specimens examined.—Total number 2,077, from localities as follows:

California: Adin, 2; Ager, 1; Alila, 11;[a] Alta Peak, Kaweah River, 1; Alturas, 2; Alum Rock Park, 24; Aspen Meadow, Tuolumne County, 7; Auburn, 2; Ballena, 3;[a] Banta, 6; Bartlett Mountain, 2; Bartlett Springs, 2; Bear Valley, San Benito County, 1; Belmont, 2; Berkeley, 43; Beswick, 19; Bieber, 1; Bitterwater, 7; Bloods, Calaveras County, 2; Blue Canyon, 3; Brentwood, 1; Brownell, 13; Bully Choop Mountains, 3; Bunch Grass Spring, 5; Burbank, 1; Burney, 1; Burney (12 m. E.), 1; Buttonwillow, 4; Calaveras Big Trees, 15; Canyon Creek, 17; Carberry Ranch, 6; Carbondale, 2; Carpenteria, 2; Cassel, 18; Cedarville, 1;[a] Chinese Camp, 2; Colusa, 2; Cuyamaca, 1; Dana, 15; Donner, 53; Dos Palos, 1; Dulzura, 19; Dyerville, 1; Echo, 6; Emerald Bay, Lake Tahoe, 11; Encinitas, 1; Etna, 1; Fairfield, 16 (approaching *rubidus*); Fall River, 5; Ferndale, 6; Fort Crook, 10; Fremont Peak, Gabilan Range, 4; Freshwater Creek, 1; Fresno, 2; Gaviota Pass, 4; Giant Forest, Sequoia National Park, 2; Gilroy, 2; Glen Ellen, 13 (approaching *rubidus*); Goose Lake, 6; Goosenest Mountain, 2; Greenville, 2; Grizzly Mountains, 4; Halstead Meadows, 14; Hayden Hill, 1; Hermit Valley, Calaveras County, 15; Hoopa Valley, 2; Hornbrook, 1; Horse Corral Meadows,

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[a] Approaching *sonoriensis*.

1; Horse Creek, Siskiyou County, 10; Hueneme, 10; Jackson, 6; Jacumba, 54;[a] Jamesburg, 11; Jamul, 1; Jamul Creek, near El Nido, 8; Jolon, 5; East Fork Kaweah River, 9; King City, 1; Laguna Ranch, 1; Laguna Mountains, San Diego County, 9; La Panza, 2; Lassen Creek, Modoc County, 5; Lassen Peak, 12; Learlys Ranch, Mendocino County, 2; near Leesville, 3; Lemoore, 1; Little Shasta, 3; Long Valley, Lake County, 2; Los Angeles, 17;[a] Los Banos 17; Lower Alkali Lake, 1; Lyonsville, 6; Mad River, 1; Madeline Divide, 4; Madeline Plain, 12; Mansfield, 3; Marysville Buttes, 23; McKinney, 1; Mendota, 3; South Fork Merced River, 3; Merrillville, 2; Millford, 2; Mission Santa Cruz, 3; Mohawk, 3; Montague, 4; Monterey, 12; Montgomery, 1; Morro, 4; near Morro Rock, 3; Mount Dana, 1; Mount Diablo, 1; Mount Hamilton, 3; Mount St. Helena, 16; Mount Sanhedrin, 13; Mount Shasta, 102; Mount Tallac, 7; Mountain House, Butte County, 2; Nelson, 5; Nordhoff, 2; Oakdale, 1; Orosi, 1; Orris, 1; Pacheco Peak, 2; Pacific Grove, 2; Palo Alto, 2; Petaluma, 5; Picard, 15; Pine Valley, Monterey County, 13; Pitt River, 6; Pleyto, 2; Point Pinos, 7; Porcupine Flat, 1; Porterville, 3; Port Harford, 1; Posts, 5; Poway, 1; Pozo, 1; Priest Valley, 1; Pyramid Peak, 43; Quincy, 11; 20 miles SW. of Quincy, 12; Ripon, 1; Riverside, 5; Robbins Creek, 4; Rose Canyon, San Diego County, 14;[a] Round Valley, Mendocino County, 14; Salinas, 1; Salt Springs, Fresno River, 5; San Antonio, 6; San Diego, 1; San Fernando, 8; Cliff House, San Francisco, 8 (approaching *rubidus*); San Gabriel Mountains, 1;[a] San Juan, Orange County, 2; head of San Joaquin River, 2; San Luis Obispo, 11; San Luis Rey, 2; San Mateo, 2; San Miguel, 4; San Simeon, 7; Santa Barbara, 1; Santa Cruz, 1; Santa Lucia Peak, 12; Santa Maria, 3; Santa Monica, 6; Santa Paula, 2; Santa Ynez Mission, 3; Santa Ynez River, 1; Santa Ysabel, 9; Saticoy 2; Secret Valley, 3; Sierra City, 4; Sierra Valley, 36;[a] Silver Lake, 136; Sisson, 2; Slippery Ford, 4; Smith Mountain, San Diego County, 6; Snow Mountain, 38; Soledad, 1; Sonora Pass, 2; Soquel Mill, 1; Sorrento, 1; Stanford University, 34; Stanley (8 m. W. of Huron), 1; Stillwater, 1; Stockton, 1; Summit Lake (12 m. NW. of Lemoore), 1; Tassajara, 11; Tehama, 5; Temescal, 3; Three Rivers, 6; Tower House, 1; Tracy, 6; Tulare Lake, 2; Tule Lake, 4; Tuledad Canyon, 4; Tuolumne Meadows, 3; Twin Oaks, 5; Upper Lake, 1; Van Deusen River, 2; Ventura, 3; Walnut Creek, 12; Wawona, 3; Weber Lake, 2; West Riverside, 2;[a] Willows, 11; Witch Creek, 1; South Yolla Bolly Mountain, 12; Yosemite Valley, 8.

Lower California: Canyon Salado, 1;[a] Cape Colnett, 1; Carrizo Creek, 5; El Alamo, 2;[a] Encinita, 1; Ensenada, 28; Gato Creek, 2; Guadalupe Valley, 1;[a] Juncolito, 2; La Huerta, 3;[a] Los Encinas, 1;[a] Nachoguero Valley, 5; edge of Pacific Ocean at Boundary Monument No. 258, 3; Piñon, 9;[a] Pozo Luciano, 1;[a] Rancho San Antonio, 12;[a] Rancho Santo Tomas, 2;[a] Rancho Viejo, 6;[a] Rosarito, 6;[a] San Felipe, 2;[a] Saños Cedros, 6; San Pedro Martir Mountains (Coll. by Thurber and Anthony), 61;[a] San Quentin, 40; Santa Eulalia, 14;[a] Santa Rosa, 4;[a] San Telmo, 4; San Vicente, 2; San Ysidro Ranch, 16; Tecate Valley, 7; Trinidad, 6;[a] Ysadora, 1.[a]

Nevada: Deep Hole, 1; Flowing Springs, 1; Smoke Creek, 4; Summit Lake, 4.

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[a] Approaching *sonoriensis*.

Oregon: Adel, Lake County, 1; Anna Creek, Mount Mazama, 6; Antelope, 10; Bake Oven, 1; Bend, 7; Buck Creek, 2; Burns, 5; Camp Creek, 3; Crater Lake, 14; Crooked River, 4; The Dalles, 9; Detroit, 5; Diamond Lake, 3; Fort Klamath, 15; Goose Lake Valley, 2; Harney, 1; ten miles N. of Harney, 10; John Day River, 1; Lake Alvord, 3;[a] Lone Rock, 4; Lost River, Klamath Basin, 8; Matoles River, 2; Maury Mountains, 10; Mount Hood, 12 (approaching *rubidus*); Mount Jefferson, 14; Narrows, 13; Paulina Lake, 2; Pendleton, 5; Plush, 4; Prineville, 8; Rock Creek Sink, 3; Shirk, 2; Siskiyou, 6; Stein Mountains, 3; Summer Lake, 4; Summit, 1; Swan Lake Valley, 2; Twelve Mile Creek, 2; Tule Lake, 4; Wapinitia, 7; Warner Mountains, 2; Williamson River, 3.

Washington: Chelan, 19 (approaching *artemisiae*); Head of Lake Chelan, 8 (approaching *artemisiae*); Cleveland, 9; Coulee City, 2; Douglas, 1; Goldendale, 2; North Yakima, 7; Trout Lake, 2; Wenatchee, 3.

PEROMYSCUS MANICULATUS RUFINUS (MERRIAM).

Hesperomys leucopus rufinus Merriam, N. Am. Fauna No. 3, pp. 65–66, Sept. 11, 1890.

Peromyscus rufinus Allen, Bull. Am. Mus. Nat. Hist., N. Y., VIII, p. 252, Nov. 25, 1896.

Type locality.—San Francisco Mountain, Arizona, at 9,000 feet altitude.

Geographic distribution.—Southern Rocky Mountain region, including the elevated part of New Mexico, scattered peaks and ranges in Arizona, eastern Utah, and the greater part of western and central Colorado. Transition to boreal zones.

Characters.—Similar to *nebrascensis* and *sonoriensis*, but darker, more richly colored, shades of ground color richer and more tawny, dusky more extensive; similar to *arcticus* and *artemisiae*, but smaller and less extensively dusky, skull slightly different; most similar to *gambeli*, but color slightly brighter, more rufescent, particularly in unworn pelage.

Color.—Unworn pelage: Upperparts ochraceous or tawny ochraceous, thickly and finely mixed with dusky; dorsum somewhat darker than sides, or sometimes nearly same color; subauricular tufts usually conspicuous, mixed white and buffy ochraceous; ears dusky, edged with creamy white; a small dusky spot at base of whiskers and a narrow dusky orbital ring; underparts creamy white; feet and forelegs white; 'ankles' buffy ochraceous; tail blackish brown above, white below. Worn pelage: Upperparts ochraceous buff to tawny, varying in clearness according as the dusky of the unworn pelage is more or less altered and eliminated; back nearly same color as sides except in stages of slight wear. Adolescent pelage: Ground color of upperparts paler than in adults, inclining to buffy rather than tawny; dusky mixture heavier and more uniform; general effect somewhat between cinnamon and raw umber. Young in first coat: Base of hairs slate color (Ridgw. pl. II, No. 4); ends of hairs pale drabby fawn mixed with dusky brownish; general effect of upperparts mouse gray.

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[a] Approaching *sonoriensis*.

Skull.—Practically as in *nebrascensis* and *sonoriensis;* slightly smaller than in *artemisiae;* smaller and narrower than in *arcticus* and with less spreading zygomata.

Measurements.—Average of 15 adult topotypes: Total length, 160 (150–170); tail vertebræ, 70 (56–75); hind foot, 20 (19–21); ear, from notch (dry), 15.5 (14.1–16.6). Of 20 males from Manzano Mountains, New Mexico: 151 (144–165); 63.4 (59–77). Of 15 females from the same locality: 156 (142–168); 68 (61–73).

Type specimen.—No. $\frac{17648}{24682}$ U. S. National Museum, Biological Survey Collection. ♀ adult. August 22, 1889. C. Hart Merriam and Vernon Bailey. Specimen in partly worn pelage, in good condition.

Remarks.—This is a mountain form, but like other members of the *maniculatus* group it variously intergrades with surrounding forms, and differs from them only in average characters. On the north it meets *artemisiae*, from which it differs mainly in smaller size and slightly more rufescent color. Specimens from Mammoth Springs, Yellowstone Park, in unworn winter pelage are very similar to typical *rufinus* in the same pelage from Arizona and New Mexico, and others from Clarks Fork, Wyoming, in partly worn pelage are more dusky than *rufinus* and very similar to *artemisiae*, to which they are referred.

On the east, intergradation with *nebrascensis* is evidenced by specimens from the foothill region of eastern Colorado, and in some series specimens which might be referred to either form are found. Possibly, if the exact localities from which they came were known, the difference would be explained. Connection with *sonoriensis* in the same way is shown on the west, although in a series from Bluff, Utah, we find 11 specimens that are typical *rufinus* and one that is typical *sonoriensis*, which might seem to indicate that the two forms are distinct. At other localities, however, there is ample evidence of intergradation, and, indeed, individual variation in each form is almost enough to cover the average difference between the two. Moreover, *sonoriensis* unquestionably intergrades with *gambeli*, which is distinguishable from *rufinus* only with great difficulty. In worn pelage, the majority of specimens of *rufinus* are indistinguishable from *gambeli* in the same pelage. This is particularly true of specimens from the Sierra-Cascade region, which for the present are referred to *gambeli* under the belief that they are nearer that form, though undoubtedly tending somewhat toward *rufinus.* In winter pelage *gambeli* from the coast of California is more dusky and less tawny than *rufinus.* Very few specimens in winter pelage from the Sierra Nevada are available at present, but the scanty material shows somewhat more similarity to *gambeli* than to *rufinus*. Since, however, the differences are within the limits of variation, it will not be surprising if good series in winter pelage from the Sierra-Cascade region prove referable to *rufinus*.

Specimens examined.—Total number, 1,336, from localities as follows:

Arizona: Baker Butte, Mogollon Mountains, 4; Chiricahua Mountains, 131; Graham Mountains, 25; Keam Canyon, 4 (approaching *sonoriensis*); San Bernardino Ranch, 21 (approaching *sonoriensis*); San Francisco Mountain, 28; Show Low, 2; Springerville, 59; Taylor, 3; Turkey Tanks, 3; White Mountains, 66.

Colorado: Allenton, Eagle County, 2;[a] Almont, 2; Antonito, 2; Ashbaugh Ranch, 2;[a] Arboles, 2; Bayfield, 1; Black Hawk 2; Boreas Pass, Summit County, 1;[a] Boulder, 63 (approaching *nebrascensis*); Boulder County, 23; Canadian Creek, 7; Canyon City, 4; Conejos River, 2; Cortez, 1;[a] Coulter, 5; Coventry, 3; Debeque, 1; Del Norte, 1; Durango, 4; Elkhead Mountains, 1; Estes Park, 63 (approaching *nebrascensis*); Florida, 15; Fort Garland, 4; Glenwood Springs (12 miles above), 2;[a] Golden, 4; Gold Hill, 16 (approaching *nebrascensis*); Hermit, 2; Longs Peak, 22; McCoy, 1; Mesa Verde, 1; Mount McLellan, 1; Mud Springs, Garfield County, 2;[a] Naturita, 1; Nederland, 14 (approaching *nebrascensis*); Pagosa Springs, 4; Pearl, 3; Rabbit Ear Mountains, 2; Rifle, 3; Ruby Lake, 1; Salida, 1; Santa Maria Lake, 3; Sapinero, 1; Sheephorn Pass, Grand County, 2;[a] Silverton, 4; Tarryall Creek, near Puma, 1;[a] Toponas, 2; Trinidad, 1; Uncompahgre Plateau, 3; White River Plateau, 3; Whiteley, 3.

New Mexico: Abiquiu, 4; Albuquerque, 2; Amizett, 2; Ancho, 2; Arroyo Hondo, 3; Arroyo Seco, 6; Aztec, 20; Bear Canyon, Raton Range, 6; Bear Spring Mountains, 6; Boulder Lake, 1; Cabra Springs, 1; Capitan Mountains, 53; Carrizozo, 1; Chama, 10; Chama River, 2; Chico Springs, 1; Cienequilla, 6; Cloudcroft, 19; Copperton, 23; Costilla Pass, 7; Coyote Creek, 3; Datil Mountains, 25; Espanola, 7; Fisher Peak, 1; Fort Wingate, 5; Gallina, 3; Gallinas Mountains, 19; Gallo Canyon, 1; Gallup, 1; Glorieta, 5; Grants, 10; Hall Peak, 5; Hondo Canyon, 1; Jamez Mountains, 1; Jicarilla Mountains, 17; Laguna, 1; La Plata, 42; Las Vegas, 17; Long Canyon, near Catskill, 2; Manzano Mountains, 127; Mesa Jumanes, 4; head of Mimbres River, 1; Moreno Valley, 3; Pecos Baldy, 8; Piñon Hills, 1; Ribera, 2; Rinconada, 4; Rio Puerco, 4; Ruidoso, 2; Ruidoso Creek, 7; San Mateo Mountains, 20; San Pedro, 5; Santa Clara Canyon, 2; Sierra Grande, 4; Stinking Spring Lake, 2; Taos, 1; Taos Mountain, 1; Taos Pueblo, 5; Thomkins Lake, 4; Tierra Amarillo, 2; Tres Piedras, 25; 5 miles E. of Tularosa, 1; Twining, 8; Willis, 5; Willow Creek, Mogollon Mountains, 2.

Utah: Barclay, 8; Bluff City, 16; La Sal Mountains, 1; Noland Ranch, 20; Park City, 5; Riverview, 24.

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[a] Collection of E. R. Warren.

PEROMYSCUS MANICULATUS NEBRASCENSIS (MEARNS).

Hesperomys leucopus nebrascensis (Baird) Mearns, Bull. Am. Mus. Nat. Hist., N. Y., II, p. 285, Feb. 21, 1890—not *Hesperomys sonoriensis* var. *nebrascensis* Baird, *nomen nudum*, 1857.

? *Hesperomys* (*Vesperimus*) *cherrii* Allen, Bull. Am. Mus. Nat. Hist., N. Y., III, pp. 211–212, Apr., 1891—part, reference to skull only.

Peromyscus texanus nebrascensis Allen, Bull. Am. Mus. Nat. Hist., VIII, p. 251, Nov. 25, 1896—part.

Type locality.—Calf Creek, Custer County, Mont.

Geographic distribution.—Plains and foothills along the eastern base of the Rocky Mountains from south central Saskatchewan to the Panhandle of Texas, occupying in general the eastern parts of Montana, Wyoming, and Colorado, and the western and southwestern parts of Saskatchewan and the Dakotas. Upper Sonoran and Transition zones.

Characters.—Similar to *P. m. arcticus*, but color decidedly paler, more buffy ochraceous; size slightly smaller, tail averaging shorter (usually less than 70 mm.); color nearly as in *P. m. sonoriensis*, buffy and ochraceous with slight variations predominating in all adult pelages, tail shorter; very similar to *P. m. luteus*, but larger, with noticeably larger ears; also similar to *P. m. rufinus*, but color paler; somewhat similar to *P. l. aridulus*, but smaller, with a shorter, more hairy, and more sharply bicolor tail; skull smaller, with narrower braincase, smaller audital bullæ, longer parallel-sided palatine slits, and smaller molar teeth.

Color.—Unworn pelage (Sept.-Dec.): Upperparts pale ochraceous buff or between cream buff and ochraceous buff, lightly and uniformly mixed with dusky; back scarcely or not at all darker than sides; underparts pure creamy white; ears dusky brownish, broadly edged with white; subauricular tuft pure white anteriorly, nearly clear buffy posteriorly, the white usually quite conspicuous; feet and forelegs white, 'ankles' buffy or buffy and dusky; tail sharply bicolor, blackish brown above, white below. Worn pelage (Apr.–July): Similar in general to unworn pelage but color of upperparts much brighter, more ochraceous; dusky mixture becoming gradually eliminated with increasing wear and changed to cinnamon and russet; general effect of upperparts varying from ochraceous buff to tawny ochraceous. Adolescent pelage: Most similar to unworn pelage of adult but less buffy; general effect of upperparts pale drab or isabella color. Young in first coat: Upperparts slate color at base of hairs, brownish smoke-gray at tips; underparts grayish white.

Skull.—Similar in general to that of *P. m. arcticus*, but averaging slightly smaller and narrower; nasals usually longer, narrower, and more convex; braincase narrower and less arched; zygomata not so heavy nor so much 'squared' anteriorly. The skull of *nebrascensis* is essentially like those of *sonoriensis* and *rufinus*; it is larger than that of *luteus*.

Measurements.—Average of 10 adults from Fort Custer, Mont.: Total length 158.3 (147–170); tail vertebrae 63.7 (56–71); hind foot 20.1 (20–21); ear from notch (dry) 14.5 (14–15.2).

Type specimen.—No. 1200 American Museum of Natural History, New York. ♂ adult. October 16, 1887. W. W. Granger. The skin of the type is in good condition in fresh fall pelage. Its hind foot measures dry 20.8 mm. No skull corresponding to this skin can at present be found in the collection of the American Museum.

Remarks.—*P. m. nebrascensis* is almost identical in color with *sonoriensis* and very similar in general appearance. Certain specimens of *nebrascensis* in partly worn pelage are deeper, more nearly tawny ochraceous, than any *sonoriensis*, and *vice versa*, certain much-worn examples of *sonoriensis* are paler than any *nebrascensis*, but the majority of examples of each in ordinary conditions of pelage are indistinguishable by color alone.

The tail in *nebrascensis* averages constantly shorter than in *sonoriensis*, though many specimens of each are fairly between the extremes. The skulls are somewhat variable, but the same sort of variations apparently occurs in each form. The color of *nebrascensis* is also very much like that of *luteus*, which usually may be distinguished by its small size, particularly by its small ears, skull, and teeth.

P. m. nebrascensis intergrades on all sides with other forms. On the north it merges into *arcticus*, as amply proved by specimens from Osler and Moose Jaw, Saskatchewan. On the east it meets *luteus*, on the west and southwest *rufinus* and *sonoriensis*, and future collections may show its connection with *blandus* on the south.

The name *nebrascensis*, as first used by Baird in 1857, was a *nomen nudum* and deserved no definite recognition until employed in connection with a description by Mearns in 1890. This has been discussed more fully under *P. m. luteus*.

The name *Hesperomys cherrii* applies to a species of *Reithrodontomys*, but the skull of a *Peromyscus* indistinguishable from *nebrascensis* was included among the specimens originally referred to it (see Proc. Biol. Soc., XX, pp. 50–51, Apr. 18, 1907).

Specimens examined.—Total number 617, from localities as follows:

Alberta: Medicine Hat, 71.

Colorado: Baxter Pass, 3; Buford, Rio Blanco County, 1;[a] Colorado Springs, 12; near Craig, Routt County, 1;[a] Crested Butte, 1; Douglas Spring, Routt County, 1;[a] Escalante Hills, 1; Flagler, 1 (approaching *luteus*); Four Mile Creek, 4; Fruita, 1 (immature); Gaume Ranch, 8;[a] Grand Junction, 3; Ladore, 2; Lay, 2;[a] Lily, 2; Loveland, 35; Medano Ranch, 2; Meeker, 2;[a] Rangeley, 1; mouth of Sand Creek, Routt County, 1;[a] Snake River, 5; Steamboat Springs, Routt County, 2;[a] Valmont, 1; White River, 1; Wray, 4; Wright Ranch, Yampa County, 1;[a] Yarmany Creek, near McCoy, 2.[a]

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[a] Collection of E. R. Warren.

Montana: Bear Paw Mountains, 8 (approaching *rufinus*); Big Snowy Mountains, 2; Birch Creek, 6; Bower, 1; Calf Creek, 5; Columbus, 5; Fort Assiniboine, 8; Fort Custer, 26; Great Falls, 20; Jefferson River, Gallatin County, 1; Midvale, 4; Milk River, 3; Musselshell River, 2; Little Porcupine Creek, 2; Powderville, 3; Pryor Mountains, 2 (approaching *artemisiæ*); Red Lodge, 2; Robare, 6; St. Mary Lake, 16 (approaching *artemisiæ*); Shelby Junction, 4; North Branch Sunday Creek, 1; Tilyou Ranch, 1.

North Dakota: Fort Buford, 5; Glenullin, 12 (in part approaching *luteus*); Little Missouri River, 7.

Saskatchewan: Crane Lake, 7;[a] Cypress Hills, 7;[a] Moose Jaw, 11; Old Wives Creek, 10;[a] Osler, 111 (approaching *arcticus*).

South Dakota: Belle Fourche, 2; Buffalo Gap, 1; Deadwood, 1; Elk Mountain, 9; Rapid City, 3; Smithville, 10.

Texas: Washburn, 10.

Wyoming: Aurora, 10; Beaver, 1; Bighorn Basin, 2; Bighorn Mountains, 1 (approaching *rufinus?*); Bitter Creek, 7; Bridger Pass, 3; Bull Lake, 3; Clarks Fork, 4; Devils Tower, 2; Fontanelle, 1; Fort Bridger, 18 (approaching *sonoriensis*); Fort Fetterman, 1 (approaching *luteus*); Fort Laramie, 1; Fort Steele, 5; Fort Washakie, 3 (approaching *sonoriensis*); Green River, 7; Kinney Ranch, Bitter Creek, 1; Lake Fork, 3; Little Powder River, 3; Newcastle, 10; Otto, 6; Powder River Crossing, 2; Sheep Creek (17 mi. W. of Toltec), 6;[b] Sheridan, 5; Sherman, 4; South Pass City, 1; Sundance, 8; Woods, 2.

PEROMYSCUS MANICULATUS LUTEUS Osgood.

Hesperomys sonoriensis var. *nebrascensis* Baird, Mamm. N. Am., p. 464, 1857—*nomen nudum.*

Hesperomys sonoriensis var. *nebrascensis* Coues, Monogr. N. Am. Rodentia, p. 79, synonymy under *Hesperomys leucopus sonoriensis*, 1877—mentions specimens from Deer Creek, Nebraska.

Peromyscus nebrascensis of authors, not of Mearns.

Peromyscus luteus Osgood, Proc. Biol. Soc. Wash., XVIII, p. 78, Feb. 21, 1905.

Type locality.—Kennedy, Nebr.

Geographic distribution.—Sandhill region of western Nebraska and adjoining parts of the States of Kansas, Colorado, South Dakota, and Wyoming. Possibly extending north to western North Dakota and south to western Oklahoma.

Characters.—Similar to *P. m. nebrascensis*, but averaging smaller; ears decidedly smaller; color more buffy ochraceous, particularly in unworn pelage; skull and teeth averaging smaller and lighter.

Color.—Unworn pelage (Oct.-Nov.): Upperparts varying from ochraceous buff to almost orange buff lightly and uniformly lined with dusky; sides like back (occasionally a bright ochraceous buff lateral line unmixed with dusky is found), sides of face usually a trifler paler; ears dusky, broadly margined with white; subauricular tufts white or mixed white and buffy, usually very conspicuous; underparts creamy white; feet white; 'ankles' white or buffy; tail sharply bicolor, dusky brownish above, white below. Worn pelage

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[a] Collection of Canadian Geological Survey.

[b] Carnegie Museum.

(April–July): Similar to unworn pelage, but ground color brighter, dusky mixture changed to cinnamon rufous or almost entirely eliminated; general effect of entire upperparts bright ochraceous buff, slightly paler across shoulders and often slightly tinged with cinnamon rufous in middle of back. Young: Similar to *P. m. nebrascensis*, but usually slightly paler.

Skull.—Similar to that of *nebrascensis*, but averaging smaller and lighter; teeth slightly smaller; nasals usually shorter and relatively broader. Extreme type of skull about as in *P. m. bairdi;* average type slightly larger.

Measurements.—Average of 10 adults from the type locality: Total length 149 (142–158); tail vertebræ 61.5 (56–65); hind foot 19.5 (19–20.5); ear from notch (dry) 12.5 (11.8–13).

Type specimen.—No. $\frac{18668}{25447}$ U. S. National Museum, Biological Survey Collection. ♀ adult. Apr. 23, 1890. V. Bailey. Specimen in good condition.

Remarks.—Those familiar with *P. m. bairdi* (better known under the name *michiganensis*) will readily recognize *luteus*, which is practically identical in every respect save color. Its bright buffy ochraceous color easily distinguishes it from *bairdi*, while its small size separates it from nearly all other forms. In the somewhat brightened and worn pelages of spring and summer its color is practically like that often shown at the same season by *nebrascensis* and *sonoriensis;* but in fresh fall and winter pelage it is more ochraceous than either of these forms. Its small size, and particularly its small ears, are usually safe guides in separating it from *nebrascensis*, which is the form with which it is most apt to be confused. In the center of its range—that is, in the sandhills of Nebraska—its characters are well established, but on either side intergrading specimens occur, approaching *bairdi* on the east and *nebrascensis* on the west. Although the average typical *nebrascensis* is decidedly larger than typical *luteus*, the amount of individual variation in either form is almost enough to cover the two extremes. In spite of this fact, and in spite of fairly convincing evidence of gradual intergradation around the periphery of its range, typical *luteus* and *nebrascensis* sometimes occur together. For example, a series of 13 specimens from Elk Mountain, South Dakota, contains 5 that are typical of *luteus* and 8 that are as typical of *nebrascensis*. Two specimens from Dickinson, N. Dak., are unquestionably referable to *luteus*, although the locality is quite removed from the general range of the form and well within the supposed precincts of *nebrascensis*.

The name *nebrascensis* has been applied frequently to the form now called *luteus*, and it was doubtless intended by Baird for that form. This is made clear by Coues (Monogr. N. Am. Rodentia, p. 79, 1877), who states that Baird based the name upon two specimens from Deer Creek, Nebraska. As used by Baird and Coues, it was unquestionably a *nomen nudum*, and so remained until Mearns redefined it and selected a new type belonging to a form different from that to which Baird intended to apply the name.

Specimens examined.—Total number 253, from localities as follows:

Colorado: Spring Canyon, near Fort Collins, 5.[a]

Kansas: Hays, 6 (approaching *bairdi*); Logan County, 2; Long Island, 1; Pendennis, 14; Trego County, 7.

Nebraska: Callaway, 9; Broken Bow, 1; Cherry County, 13; 10 miles S. of Cody, 4; Deer Creek, 1; Haigler, 8; Kennedy, 20; 18 miles NW. of Kennedy, 4; Perch, Rock County, 14; Thomas County, 1; Two Mile Lake, Cherry County, 1; Valentine, 1.

North Dakota: Bottineau, 3; Dickinson, 5; Medora, 1 (identity not certain); Minnewaukan, 6.

Oklahoma: North Beaver River, 7.

South Dakota: Cheyenne River, 3; Corral Draw, Pine Ridge Reservation, 46; Custer (?), 35; Elk Mountain, 9; "Southern Dakota," 3; Spring Creek, 10; Squaw Creek, 12 (approaching *bairdi*).

Wyoming: Little Medicine, 1.[a]

PEROMYSCUS MANICULATUS BAIRDI (HOY AND KENNICOTT).

(Pl. II, fig. 10.)

Mus bairdii Hoy and Kennicott, in Kennicott, Agricultural Report, U. S. Patent Office (1856), pp. 92-95, Pl. XI, 1857.

Peromyscus michiganensis of authors, not of Audubon and Bachman.

Peromyscus bairdi Snyder, Bull. Wis. Nat. Hist. Soc., II, p. 116, April, 1902.

Type locality.—Bloomington, McLean County, Ill.

Geographic distribution.—Prairie region of the upper Mississippi Valley in southern Wisconsin, Minnesota, Illinois, Indiana, eastern Ohio, Iowa, Missouri, Oklahoma, and the eastern or humid parts of Kansas, Nebraska, South Dakota, and North Dakota; north to southern Manitoba: Upper Austral and Transition zones, meeting the range of *P. m. luteus* along the border between the humid and the arid subdivisions.

Characters.—Size and proportions about as in *P. m. luteus;* color very dark, dorsum usually black or very dark brown; ears and feet smaller and tail decidedly shorter than in *leucopus* or *noveboracensis;* tail more thickly haired and more sharply bicolor.

Color.—Unworn winter pelage: Upperparts russet or Mars brown heavily mixed with black, the latter usually concentrated in the middle of the back; sides also heavily mixed with black, but usually noticeably paler than back; sides of face nearly the same as sides of body, somewhat paler than top of head; underparts pure creamy white, often separated from the sides by a narrow russet lateral line; ears brownish black, very narrowly margined with creamy; subauricular tufts mixed russet and dusky, very rarely with a few white hairs; feet white, 'ankles' usually extensively blackish brown, this sometimes extending out on top of foot; tail sharply bicolor, black or blackish brown above, white below. Slightly worn pelage of spring: Similar to unworn pelage, but contrast between back and sides somewhat heightened, black predominating on the back and brownish russet on the sides. Summer pelage (June–July): The extremely worn pelage becomes brighter, more nearly russet throughout, and the dark dorsal area is much reduced and changed to pale brownish. The short new pelage as it begins to come in is also uniform russet lightly sprinkled with dusky and with very little or no decided difference between back and sides. Young: Darker than adults, black usually predominating, more or less modified on the sides by grayish broccoli brown.

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[a] Collection of Colorado State Agricultural College.

Skull.—Practically as in *P. m. luteus*, possibly averaging slightly smaller with shorter nasals. General characters as in *nebrascensis*, *sonoriensis*, etc., but size smaller. Compared with those of *noveboracensis* and *leucopus* it is much smaller; teeth, braincase, and audital bullæ much smaller; palatine slits relatively longer and with sides more nearly parallel.

Measurements.—Two adults from Racine, Wis.: Total length 161, 140; tail vertebræ 70, 54; hind foot 19, 18; ear from notch (dry) 11.6, 10.6.

Type specimen.—The only specimen now extant having any claim to consideration as the type of this form seems to be No. 750 Collection of Academy of Natural Sciences, Philadelphia. The record in the catalogue is as follows: "No. 750, *Hesperomys bairdii.* Donor Dr. LeConte. Locality Illinois. Entered January, 1860." The specimen now bears a red label marked "Type of *Mus bairdii* Hoy and Kennicott." This label, however, is recent, as also a white one which reads in the handwriting of Witmer Stone: "750 *Hesperomys bairdii.* Illinois. Type." Mr. Stone informs me that, according to his recollection, these data were transcribed by him from the stand upon which the specimen was formerly mounted. The specimen, though identifiable and unquestionably of this form, is in very poor condition and of little interest save from a historical standpoint.

Remarks.—Under the name *michiganensis* this mouse has been well known for years. Its small size, sharply bicolor and somewhat penciled tail, and its cranial characters serve to distinguish it easily from *leucopus* or *noveboracensis*, while its dark color at once separates it from *luteus* and *nebrascensis*, to which it is really most closely related. It appears to be confined to the prairie or more open parts, including cultivated fields, of the central Mississippi Valley, while *leucopus* and *noveboracensis* are found in wooded parts of the same region. Its known eastern limit is in eastern Ohio and southern Ontario, but with the clearing of the land it is apparently extending its range to the eastward. Thus it is now found at Elk River, Minnesota, as evidenced by a specimen collected by A. B. Mills in 1899, although some ten years earlier Vernon Bailey made large collections there and did not secure it.

Along the border between the humid and arid regions it intergrades with *P. m. luteus.* Specimens from Pierre, S. Dak., are perfect intermediates, and others throughout the western part of its range tend more or less toward *luteus.* In west central Oklahoma it apparently intergrades with *nebrascensis* rather than with *luteus*, and in southern Oklahoma it probably meets *P. m. pallescens*, though the evidence in both cases is rather unsatisfactory. A small series from Fort Reno, Okla., are slightly paler than *bairdi*, but decidedly darker than *luteus* or *nebrascensis;* the ears are small, as in *bairdi*, but the skulls are rather large, as in *nebrascensis.* Specimens from Chattanooga, Oklahoma, and Belle Plain, Kans., agree fairly well with those from Fort Reno. A little to the westward we have fairly typical *nebrascensis* from Washburn, Tex., and to the eastward we find *bairdi* at Red Fork, Okla. Thus the Fort Reno specimens are intermediate in characters and in geographic situation, so the most logical treatment seems to be to refer them to *bairdi*, the form they most resemble. Surely nothing is to be gained by making such intermediate specimens the basis of new names.

The name *michiganensis* was adopted for this form by Baird (Mamm. N. Am., p. 416, 1857), who evidently was misled by the rather small measurements published by Audubon and Bachman for their supposed new species. Subsequent authors have followed Baird in the use of the name. A careful analysis of the original description of *michiganensis*, however, leads to the conclusion that it was based upon an immature example of *P. l. noveboracensis*, as the following extracts indicate:

> Mouse with yellow cheeks, a light grayish brown color above, whitish beneath. This species bears some resemblance in size and colour both to the common house mouse (*M. musculus*) and the white-footed mouse (*M. leucopus.*) The colour on the back resembles the former and on the under surface the latter.[a]

Hoy and Kennicott appreciated the difference between *bairdi* and *michiganensis*, but supposed that three forms were distinguishable.

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[a] Aud. and Bach., Jour. Acad. Nat. Sci. Phila., VIII, pt. II, pp. 304-306, 1842.

This is shown by a letter from Doctor Hoy, quoted by Baird, as follows:

> I consider the difference between the oak opening deer mouse (*michiganensis*) and the prairie deer mouse (*bairdii*) to consist mainly in the more uniform color, longer tail, and larger head of the former, giving to it the look more of the common house mouse than the latter.[a]

The facts of the case were suspected also by Coues, who says:[b]

> There are, however, several discrepancies between the description of Audubon and Bachman and the characters of the animal which Hoy, Kennicott, Baird, and ourselves describe. * * * We fail to realize "cheeks yellow," though, perhaps, they are a little brighter than surrounding parts. The dimensions given, 4 inches for length of head and body, are so much greater (by a full inch) that possibly the figure "4" may be a typographical error; but then the tail, 2¼, is nearly as much in excess of what we find. It is barely possible, after all, that, as Professor Baird hints, none of our specimens are what Audubon and Bachman called *michiganensis*. In that event, and if positively distinct from Audubon's and Bachman's animal, they would, of course, bear the name *bairdii* and *michiganensis* Aud. & Bach. be relegated among the unnumbered synonyms of *leucopus*.

Specimens examined.—Total number 334, from localities as follows:

Illinois: Chicago, 7; Fox Lake, 1; "Illinois," 1; Parkersburg, 4; West Northfield, 4.
Indiana: Bicknell, 2;[c] Bloomington, 5;[d] Denver, 8.
Iowa: Clay County, 5; Knoxville, 12; Marion County, 2; Palo Alto County, 4.
Kansas: Belle Plain, 5 (approaching *luteus*); Fort Leavenworth, 2; Lawrence, 28; Lost Springs, 2; Manhattan, 2; Medicine Lodge, 1 (approaching *luteus*); Onaga, 28.
Manitoba: Aweme, 1;[e] Carberry, 1.[e]
Michigan: Sand Point, Huron County, 5.[f]
Minnesota: Browns Valley, 2; Elk River, 1; Fort Snelling, 54. Steele County, 5.
Missouri: Carthage, 3;[g] Independence, 1; Stotesbury, 19.
Nebraska: Columbus, 3; Ewing, 1; Grand Island, 1; London, 5; Verdigris, 1.
North Dakota: Devil's Lake, 13 (approaching *luteus*); Harrisburg, 1; Harwood, 3; Jamestown, 1; Oakes, 2; Pembina, 5; Portland, 10.
Ohio: London, 2.[h]
Oklahoma: Chattanooga, 2 (approaching *nebrascensis*); Fort Reno, 7 approaching *nebrascensis*); Mount Scott P. O., 1 (approaching *pallescens*); Red Fork, 6.

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[a] Baird, Mamm. N. Am. p. 417, footnote, 1857.

[b] Monogr. N. Am. Rodentia, p. 96, 1877.

[c] Received for identification from E. J. Chanler.

[d] Coll. Univ. of Indiana, collected by W. L. McAtee.

[e] Collection of Ernest T. Seton.

[f] Collection of University of Michigan.

[g] Collection of H. H. T. Jackson.

[h] Loaned by Prof. J. I. Hine of the Ohio State University.

Ontario: Leamington, 2;[a] Point Pelee, 7.[a]
South Dakota: Flandreau, 5; Fort Sisseton, 1; Travere, 4; Vermilion, 4.
Wisconsin: Beaver Dam, 12; Delavan, 3; Milton, 12; Racine, 3; Rock Prairie, Rock County, 2.

PEROMYSCUS MANICULATUS PALLESCENS (ALLEN).

(Pl. II, fig. 9.)

Peromyscus michiganensis pallescens Allen, Bull. Am. Mus. Nat. Hist., N. Y., VIII, p. 238, November 21, 1896.

Type locality.—San Antonio, Tex.

Geographic distribution.—Central Texas, from the vicinity of the northern boundary at Gainesville south to the region immediately west of Corpus Christi Bay. Lower Sonoran zone.

Characters.—Similar to *P. m. bairdi*, but averaging smaller; color somewhat paler, less blackish.

Color.—Topotype No. 87876, ♂ adult. Feb. 9: General color of upperparts pale russet, lightly mixed with dusky on sides and more heavily in middle of back; middorsal region not solid black nor dusky, but mixed dusky and pale russet; shoulders and nape about like sides; ground color nearly ochraceous buff, showing unmixed with dusky in the subauricular tufts and in the interfemoral region about the base of the tail; ears dusky, whitish edged; feet white, 'ankles' slightly brownish; tail dusky brownish above, white below; underparts creamy white, rather thinly overlaying pale plumbeous undercolor. Worn pelage: Not positively known but as indicated by specimens in changing pelage, chiefly pale russet varying nearly to Mars brown in middle of back. Young in first coat: Upperparts slate gray, slightly darker in middle of back. Adolescents: General effect of upperparts broccoli brown produced by pale fawn mixed with dusky.

Skull.—As in *bairdi*, but averaging somewhat smaller.

Measurements.—Average of 9 adult topotypes: Total length, 126 (121–130); tail vertebræ, 51 (50–52); hind foot, 16 (15–17); ear from notch (dry), 11.7 (11.2–12.7).

Type specimen.—No. $\frac{12213}{10666}$ American Museum of Natural History, New York. ♂ young adult. Feb. 7, 1896. H. P. Attwater. Skin perfect and in full winter pelage. Skull with right audital bulla and right side of basioccipital broken.

Remarks.—Except the small series from the type locality, very few specimens of this form have been taken. It therefore appears to be rare or difficult to secure, as considerable collecting within its range has been done recently. In color it resembles intermediates between *bairdi* and *luteus*, such as occur in central Nebraska and Kansas. With the exception of *P. taylori*, it is the smallest member of the genus found in Texas and should be easily recognizable.

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[a] Collection of W. E. Saunders. Mr. Saunders writes, July 27, 1908, that he has specimens of *bairdi* also from Grand Bend and the mouth of the Sauble River.

As judged by rather limited material, *pallescens* is remarkably similar to *P. polionotus* of Georgia and Florida, differing only in slight cranial characters. The wide region separating their ranges, however, is, so far as known at present, uninhabited by closely related forms.

Specimens examined.—Total number 14, from localities as follows:

Texas: Alice, 1; Gainesville, 1; San Antonio, 11; Waco, 1.

PEROMYSCUS MANICULATUS BLANDUS Osgood.

Peromyscus texanus Mearns, Proc. U. S. Nat. Mus., XVIII, p. 446, footnote, 1896—not of Woodhouse.

Peromyscus sonoriensis blandus Osgood, Proc. Biol. Soc. Wash., XVII, p. 56, Mar. 21, 1904.

Type locality.—Escalon, Chihuahua, Mexico.

Geographic distribution.—Lower Sonoran zone of western Texas from the Pecos Valley westward; north along the Pecos Valley and other Lower Sonoran valleys of southern New Mexico to about latitude 34° north; south in Mexico east of the Sierra Madre in Chihuahua, southern Coahuila, southwestern Nuevo Leon, western Tamaulipas, northwestern San Luis Potosi, Durango, and Zacatecas.

Characters.—Similar to *P. m. sonoriensis*, but averaging smaller; tail shorter (usually less than 75); color more vinaceous; likewise similar to both *P. m. labecula* and *P. m. fulvus*, but somewhat smaller and more vinaceous. Usually dichromatic, the buff phase being quite similar to *sonoriensis* and the gray phase unique.

Color.—Type, gray phase in winter: Upperparts pale, often whitish vinaceous buff, thickly and delicately lined with dusky, producing a grayish drab general effect; a narrow lateral line of vinaceous buff; ear tufts conspicuous, mixed white and vinaceous buff; underparts creamy white; ears dusky, rather widely margined outside and inside with whitish; tail sharply bicolor; feet white, 'ankles' with traces of dusky and buffy. Topotype No. 57644, buff phase in winter: Upperparts pinkish buff instead of vinaceous buff, lined with dusky, producing a pale cinnamon general effect; otherwise similar to gray phase. Worn pelages:—Gray phase: Vinaceous buff of upperparts paler and dusky mixture changed to cinnamon fawn in varying degrees, producing an écru drab general effect. Buff phase: Upperparts nearly clear ochraceous buff with little or no dusky mixture. All stages of variation between the two phases occur.

Skull.—Similar to that of *sonoriensis*, but averaging slightly smaller; nasals slightly wider and flatter; similar to that of *P. m.*

labecula, but smaller and less angular; rostrum more depressed; zygomata more lightly built anteriorly. Cranial characters rather variable and more or less inconstant when applied throughout the range of the form.

Measurements.—Type: Total length, 145; tail vertebræ, 61; hind foot, 21. Average of 7 adult topotypes: 161 (145–173); 68 (59–75); 21.4 (21–22); ear from notch (dry), 14.9 (13.8–15.3).

Type specimen.—No. 57635 U. S. National Museum, Biological Survey Collection. ♀ adult. Nov. 27, 1893. E. A. Goldman. Specimen in excellent condition.

Remarks.—Any small, short-tailed mouse with conspicuous ear tufts and a slightly pinkish or vinaceous cast to its general color, if from western Texas, southern New Mexico, or northwestern Mexico, may be safely referred to this form. In full winter coat it presents an attractive appearance, the pelage being exceedingly soft and the coloration very delicate. The two phases of coloration are very distinct and examples of both may be found in almost every series. Specimens in the buff phase, especially in worn pelage, are difficult to distinguish from *sonoriensis*, but the presence of one or more in the gray phase showing the pinkish tints not found in *sonoriensis* usually furnishes the clue to the identity of any particular series. In the northern part of its range, *blandus* is often found at the same localities with *P. l. tornillo*, from which it is easily distinguished by numerous characters, among which may be mentioned the following: Size smaller; tail shorter, more distinctly penciled, and more sharply bicolor; subauricular tufts more prominent and nearly always extensively white; nasals flatter; premaxillæ less swollen laterally; braincase smaller. Intergradation is evident in the north with *P. m. rufinus* and in the south with *P. m. labecula*. It meets *rufinus* in the foothills of the mountains of southern New Mexico, and, although the line may be drawn quite sharply between the two forms, there is only a slight color difference and this is practically bridged by the variation in *rufinus* from different elevations. Specimens from Berriozabal, Zacatecas, agree in color with *blandus*, but vary in size and cranial characters to an extent that covers the extremes of both *blandus* and *labecula*. Two specimens from still farther south, at Lagos, Jalisco, seem referable to *blandus*, while series from Zacatecas City and Valparaiso Mountains, localities northwest of Berriozabal, are referable to *labecula*, though possibly somewhat intermediate.

Specimens examined.—Total number 162, from localities as follows:

Chihuahua: Chihuahua, 7; Escalon, 15; Gallego, 4; Mesquite Springs, near U. S. Boundary, 5.

Coahuila: Jimulco, 1; La Ventura, 1; Saltillo, 3.

Durango: Inde, 1; Rio Sestin, 14; Rosario, 2; San Gabriel, 2; Villa Ocampo, 3.

Jalisco: Lagos, 2.

New Mexico: Adobe Ranch, Grant County, 1; near Alamogorda, Otero County, 3; Animas Valley, Grant County, 1; Burley, 5; Carlsbad, 1; near Carrizalillo Spring, 4; Deming, 1; Dog Spring, Grant County, 3; Hachita, 4; Hatchet Ranch, Grant County, 1; Jarilla, 1; Mesquite Springs, 6; Tularosa, 13.

Nuevo Leon: Doctor Arroyo, 9.

San Luis Potosi: Hacienda La Parada, 4.

Tamaulipas: Miquihuana, 12.

Texas: Franklin Mountains, 1; Marathon (53 m. south), 1; Marfa, 5; Maxon Spring, 1; Presidio County, 2; Sierra Blanca, 3; Toyahvale, 1; Valentine, 1.

United States-Mexican Boundary: Corner Monument, 100 miles west of El Paso, 5; 50 miles west of El Paso, 5.

Zacatecas: Berriozabal, 6; Canitas, 2; Plateado, 1.

PEROMYSCUS MANICULATUS FULVUS OSGOOD.

Peromyscus sonoriensis fulvus Osgood, Proc. Biol. Soc. Wash., XVII, p. 57, Mar. 21, 1904.

Type locality.—Oaxaca, Oaxaca, Mexico.

Geographic distribution.—Southeastern Mexico, in parts of the States of Oaxaca, Puebla, Veracruz, Tlaxcala, and Hidalgo, extending from Oaxaca City north to the vicinity of Pachuca, Hidalgo. Lower Sonoran zone.

Characters.—Similar to *sonoriensis*, *blandus*, and *labecula*, but color darker and more rufescent; skull about as in *blandus*, but anterior part of zygoma usually heavier and more deeply notched by infraorbital foramen.

Color.—April and May specimens: General color of upperparts russet, deepening in middle of back to darker (Mars brown and Prout brown); underparts creamy white; subauricular tufts prominent, buffy or pale creamy; tail sharply bicolor, brown above, white below; feet and forelegs white; outer side of 'ankles' brownish. Worn pelages somewhat brighter colored, running to ochraceous and tawny, but not very decidedly different from fresher pelages. Fall and winter pelages apparently with considerable mixture of dusky in middle of back.

Skull.—Similar in general to that of *blandus*, but anterior part of zygoma averaging somewhat heavier and more deeply notched by infraorbital foramen; similar to that of *labecula*, but smaller and shorter; zygomata not so heavy nor so broadly expanded anteriorly; nasals rather short and wide. Cranial characters more or less variable throughout range.

Measurements.—Type: Total length, 167; tail vertebræ, 68; hind foot, 22. Average of 10 adults from Chalchicomula, Puebla: 162 (150–183); 71.5 (65–78); 22; ear from notch (dry) 15.5 (14.2–16.9).

Type specimen.—No. 68655 U. S. National Museum, Biological Survey Collection. ♂ adult. June 12, 1894. E. W. Nelson and E. A. Goldman. Specimen in good condition.

Remarks.—*P. m. fulvus* is the southernmost representative of the widely distributed *maniculatus* group. In general terms it may be said to be a somewhat more brownish edition of the well-known United States form, *P. m. sonoriensis.* It does not appear to be dichromatic like *blandus*, but it is not unlikely that future collections (from eastern San Luis Potosi, for example) will show that it intergrades with that form. Intergradation with *labecula* is indicated by specimens from Amecameca, Mexico, which are rather dusky, particularly on the dorsum. The specimens, however, were taken in February, whereas those considered typical of *fulvus* were taken in April, May, and June, so that the darker color of the Amecameca series may represent merely a seasonal difference. *P. m. fulvus* might possibly be confused with *P. melanotis*, although it is very distinct. In *melanotis* the tail is slightly shorter, the ears are larger and darker, the pelage usually longer and more fluffy, and the skull differs noticeably in its longer, more slender rostrum. *P. affinis* may be found at the same localities with *fulvus*, but will be easily distinguished by the characters of the *leucopus* group, particularly by its shorter pelage, longer, less distinctly bicolor, and practically unpenciled tail, and by the absence of distinct preauricular spots.

Specimens examined.—Total number 124, from localities in Mexico as follows:

Hidalgo: El Chico, 1; Irolo, 9; Pachuca, 10; Sierra de Pachuca, 3; Real del Monte, 25; Tulancingo, 7.
Mexico: Amecameca, 10.
Oaxaca: Huajuapam, 2; Oaxaca, 3.
Puebla: Chalchicomula, 17; Esperanza, 8.
Tlaxcala: Apixaco, 4; Huamantla, 5.
Veracruz: Las Vigas, 3; Perote, 3; Cofre de Perote, 1; Xuchil, 13.

PEROMYSCUS MANICULATUS LABECULA ELLIOT.

Peromyscus labecula Elliot, Field Col. Museum, Zool. Ser., III, pp. 143–144, Mar. 1903.
Peromyscus sonoriensis labecula Osgood, Proc. Biol. Soc. Wash., XVII, p. 57, Mar. 21, 1904.

Type locality.—Ocotlan, Jalisco, Mexico.

Geographic distribution.—Southwestern and south central Mexico, chiefly in the States of Jalisco, Guanajuato, and Mexico. Lower Sonoran and Upper Sonoran zones.

Characters.—Similar in general to *sonoriensis*, *blandus*, and *fulvus*, but size larger; color decidedly darker, more sooty; skull larger and more angular.

Color.—Fresh pelage, topotype No. 120135, December 30: Upperparts fawn color heavily mixed with sooty throughout, producing a general effect from drab to hair brown; middle of back somewhat darker than sides; underparts white; feet white; forelegs with traces of dusky inside; 'ankles' extensively dusky; ears blackish, faintly edged with whitish; subauricular tufts mixed whitish and fawn strongly pervaded with sooty; tail sharply bicolor, blackish above, white below. Worn pelage, topotype No. 120114: Upperparts chiefly fawn color mixed with rusty brownish, producing a general effect of nearly clear dark fawn color. Young: General effect of sides slaty gray; middle of back darker, slaty to almost black. Extreme types of coloration are more sooty, less fawn, than in specimens from the type locality.

Skull.—Slightly larger, longer, and more angular than in *sonoriensis*, *blandus*, and *fulvus;* anterior part of zygoma very heavy and deeply notched by interorbital foramen; braincase relatively small.

Measurements.—Average of 10 adults from the type locality: Total length, 173 (168–182); tail vertebræ, 72 (64–82); hind foot, 22.5 (22–24); ear from notch (dry), 14.9 (14.5–15.5).

Type specimen.—No. 8693 Field Museum of Natural History. June, 1901. F. E. Lutz. Skin poorly made; side of head torn; feet slightly injured; tail vertebræ not removed from skin; skull with anterior part of right zygoma broken; teeth much worn.

Remarks.—Except in certain worn pelages, this form is always more or less sooty in color. It is less confined to the Lower Sonoran zone than *blandus* and *fulvus* and apparently enters even the Transition, where it ranges with *P. melanotis.* In certain pelages it is often scarcely distinguishable by color alone from *P. melanotis.* Its skull, however, always presents diagnostic characters in the shorter, broader rostrum, and narrower, less-rounded braincase. It approaches, also, *P. l. mesomelas* in color, but is of course distinguished by the numerous characters which separate the *maniculatus* and *leucopus* groups.

Specimens from Etzatlan and Atemajac, Jalisco, seem to be somewhat intermediate between *labecula* and *blandus*, while those from Ajusco, Federal District of Mexico, approach *fulvus.* Two specimens from Hacienda Magdalena, Colima, are tentatively referred to *labecula*, although they are very small and rufescent. Possibly they represent a slightly characterized coast form or an approach to *fulvus.* Several from Tepic also are small and have short, broad nasals and small molar teeth, but in view of the known cranial variability in the group and the scantiness of material, it does not seem wise to attempt to define such forms.

Specimens examined.—Total number 152, from localities in Mexico as follows:

Colima: Hacienda Magdalena, 2 (aberrant).
Guanajuato: Irapuato, 6; Santa Rosa, 1; Silao, 1.
Hidalgo: Ixmiquilpan, 1; Zimapan, 2.

Jalisco: Arroyo de Plantinar, 3; Atemajac, 4; El Molino, 2; Estancia, 4; Etzatlan, 3; Garabotos, 1; Mascota, 1; Ocotlan, 41; Plantinar, 1; Sierra Nevada de Colima, 9; Zapotlan, 6.
Michoacan: Patamban, 2; Patzcuaro, 1.
Morelos: Huitzilac, 1; Yautepec, 3.
Mexico: Ajusco, 4 (not typical); Tlalpam, 8; Toluca Valley, 15; north slope Volcan Toluca, 2.
Tepic: Ojo de Aguas, near Amatlan, 4; Tepic, 3.
Zacatecas: Valparaiso Mountains, 16; Zacatecas, 5.

PEROMYSCUS MANICULATUS SONORIENSIS (LE CONTE).

Hesperomys sonoriensis Le Conte, Proc. Acad. Nat. Sci., Phila., VI (1852–3), p. 413, 1853.
Hesperomys leucopus deserticolus Mearns, Bull. Am. Mus. Nat. Hist., N. Y., II, pp. 285–286, Feb., 1890—Mohave River, 12 miles below Hesperia, Calif.
Sitomys insolatus Rhoads, Proc. Acad. Nat. Sci., Phila., pp. 256–257, Oct. 23, 1894—Oro Grande, San Bernardino County, Calif.
[*Peromyscus texanus*] *sonoriensis* Mearns, Proc. U. S. Nat. Mus., XVIII, p. 446, Mar. 25, 1896.
Peromyscus oresterus Elliot, Field Col. Mus., Chicago, Pub. 74, Zool. Ser., III, pp. 159–160, Apr., 1903—Vallecitos, San Pedro Martir Mountains, Lower California, Mexico.

Type locality.—Santa Cruz, Sonora, Mexico.

Geographic distribution.—Great Basin region in general. Northern Sonora, southern and western Arizona and Utah, exclusive of the higher mountains, northeastern Lower California east of the San Pedro Martir Mountains, southern and eastern California east of the Sierra Nevada and the San Bernardino and associated ranges, practically all of Nevada, and parts of southeastern Oregon and south-central Idaho.

Characters.—Similar in general to *P. m. nebrascensis;* size averaging larger, tail longer (70 to 80 mm.); slightly dimorphic in color, but less so than in *blandus;* predominating color in most adult pelages ochraceous buff; white spots at anterior base of ear usually conspicuous; color paler, less mixed with dusky than in *rufinus* and *gambeli.*

Color.—Unworn pelage, pale phase represented by No. $\frac{20786}{35890}$ U. S. National Museum, from Lochiel, Pima County, Ariz.: Ground color of upperparts ochraceous buff lightly and uniformly mixed with fine dusky lines; back scarcely or not at all darker than sides; underparts white or creamy white; ears dusky, rather broadly edged with whitish; subauricular tufts chiefly ochraceous buff lightly mixed with dusky, but with a small tuft of pure white hairs at the anterior base of the ear; little or no dusky at base of whiskers and no orbital ring, although the eyelids may be dusky; feet and forelegs white, tarsal joints white, buffy, or buffy slightly mixed with dusky; tail brownish dusky above, white below. Dark phase, represented by No. 58788 U. S. National Museum, from Santa Cruz River, Sonora: Similar to pale phase, but darker, often closely resembling normal pelages of *rufinus* and *gambeli;* ground color of upperparts ochraceous, or even tawny ochraceous, usually with a more or less vinaceous cast; dusky mixture heavier; basal color of hairs darker; dusky markings about face inclined to be slightly developed; white in subauricular tufts reduced or obsolete; 'ankles' usually somewhat dusky. Worn pelage: Dusky mixture of upperparts much reduced and changed to cinnamon or russet, so that the general effect becomes clear ochraceous buff, lightly overcast with russet; this change is effected without much abrasion, so that specimens in full long pelage may have the predominating ochraceous buff color; in extreme wear the darker mixture is very pale and almost eliminated and the general color paler, becoming nearly cream buff or pinkish buff; the difference between the dark and light phases in worn pelage is minimized, one being merely somewhat more vinaceous than the other. Adolescent pelage: Upperparts mixed dusky and pale clay color. general effect varying from wood brown to broccoli brown. Young in first coat: Upperparts slate color at base of hairs, pale drab gray at tips.

Skull.—About as in that of *nebrascensis*, possibly averaging slightly larger; also similar to those of *gambeli*, *rufinus*, and *blandus;* slightly larger than in *blandus* and *gambeli*, with nasals averaging longer and more convex; braincase smaller and narrower than in *arizonae* or any of the *leucopus* group; palatine slits relatively long and nearly parallel-sided.

Measurements.—Average of 10 adults from Santa Cruz River, Sonora: Total length 166 (152–176); tail vertebræ 75 (65–80); hind foot 20.7 (20–21.5); ear from notch (dry) 16.4 (15.2–17.7). Of 10 adults from Oro Grande and Mohave, Calif.: 164 (150–174); 72 (60–80); 19.8 (19–21). Of 10 adults from Panamint Mountains, Calif.: 165 (155–172); 73 (64–82); 20.2 (19–21). Of 10 adults from Vallecitos and Hanson Lagoon, Lower California (exclusive of type of *P. oresterus*): 165.8 (158–173); 76.6 (71–82); hind foot 20.8 (19.5–22).

Type specimen.—No. $\frac{146}{1128}$ U. S. National Museum. Immature. Sex? 1851. J. H. Clarke. Skin in grayish plumbeous first coat; in fairly good condition, being made in proper form like a modern skin, evidently having been renovated after being originally preserved in alcohol. Pelage somewhat greasy and stained, but color not materially different from recent specimens in same pelage. The skull has been broken through the interorbital constriction and glued together. The braincase, audital bullæ, and posterior parts of the skull are nearly perfect; the anterior parts are also in fair condition, although the boundaries of the long palatine slits are slightly broken. The teeth are intact, except the last left upper molar, which is absent. Left mandible perfect; right mandible with processes broken off.

That this specimen is actually the type of *sonoriensis* is vouched for by Baird (Mamm. N. Am., p. 475, 1857), who states that it was the basis of LeConte's name and description. Its immaturity makes the skin practically worthless for distinguishing it from *arizonae*, which occurs in the same region, but the characters of its skull, particularly the small comparatively narrow braincase, are conclusive.

Remarks.—The name *sonoriensis* as applied to some form of white-footed mouse is well known, perhaps almost as well as the name *leucopus.* It was recognized by Baird in 1857, and although placed as a synonym of *leucopus* by Coues in 1877, it has had some sort of recognition for more than fifty years. Fortunately the name may now be applied in a general way to the same form with which it has always been associated. To distinguish it from *nebrascensis*, *rufinus*, *gambeli*, and other forms with which it intergrades will doubtless always be difficult, but its short, well-haired, and sharply bicolor tail will separate it from most forms from which it is specifically distinct. It may possibly be confused with *arizonae* when both are found at the same or neighboring localities, for although *sonoriensis* and *arizonae* are unequivocally distinct species respectively representing large groups, in certain pelages many specimens might be misidentified by one not thoroughly familiar with the characters of the two groups. The most important characters of *sonoriensis* as contrasted with *arizonae* are as follows: Size smaller; tail shorter, more hairy, and more sharply bicolor; white subauricular spots usually well developed; skull smaller; braincase decidedly narrower and relatively deeper; palatine slits relatively longer and more nearly parallel-sided; mandibles more slender.

P. m. sonoriensis ranges in general throughout the Great Basin region and prefers relatively arid country, although apparently it is absent from the hottest parts of the lower Sonoran zone, where *P. eremicus* thrives. It intergrades with the large number of forms which range to the borders of the Great Basin, including *nebrascensis*, *rufinus*, *artemisiae*, *blandus*, and *gambeli.* The differences separating all these forms, although undeniably sufficient, are at most differences in shade of color or in average size and proportions. Frequently the average difference in color is enough to be appreciated by any amateur, while nevertheless absolutely bridged by individual variation. It may be easily seen therefore that the certain identification of single specimens or even small series from border regions or intergrading areas is next to impossible. However, the attempt has been made to allocate specimens as nearly as possible with the forms which they seem to resemble most. Along the east slope of the Sierra Nevada Mountains, in the Tejon Pass region, and thence south along the eastern side of the San Bernardino Mountains and to the east of the San Pedro Martir Mountains, *sonoriensis* intergrades with the darker and smaller *gambeli;* it meets *artemisiae* in central Idaho, where specimens occur that are colored like *sonoriensis*, but attain almost the size of *artemisiae;* in southwestern Wyoming and northern Utah it apparently intergrades with *nebrascensis;* in the mountains of central and western Nevada and also in Utah it shows tendencies toward *rufinus;* and in southeastern Arizona, southwestern New Mexico, and adjacent parts of Mexico it connects with *blandus:* in northern and central Lower California it merges with *coolidgei.*

The predominating color is ochraceous buff, practically like that of *nebrascensis;* in slightly worn pelage it becomes very bright, with little or no dusky. The bright slightly worn specimens are usual in spring and early summer, but the sequence of pelages conforms less with season than in the more northern forms, and worn specimens are often taken in midwinter. The existence of two phases of color, one darker and somewhat vinaceous and the other paler and more yellowish, seems to be beyond question, but the pale phase is much the more prevalent and the difference between the two is not nearly so marked as in *P. m. blandus.* Specimens from the Mohave Desert and other parts of southeastern California seem to average very slightly smaller than typical *sonoriensis;* others from northeastern Lower California average slightly larger; in neither case, however, is the difference sufficiently marked or constant to warrant recognition by name, particularly since series that measure slightly larger or smaller are found throughout the entire range. *Hesperomys l. deserticolus* and *Sitomys insolatus*, both from the same vicinity in the Mohave Desert, and *Peromyscus oresterus*, from northern Lower California, are therefore considered as synonyms of *sonoriensis.* The type of *P. oresterus* is evidently abnormally long-tailed, since the average of a series of topotypes is much smaller, being almost exactly the same as that of a series of typical *sonoriensis.*

Specimens examined.—Total number, 1,923, from localities as follows:

Arizona: Adonde, Yuma County, 3; Head of Barbacomori Creek, San Pedro Valley, 1; Calabasas, 5; Dos Cabesos, 1; Ehrenberg, 1; Fairbank, 5; Fort Huachuca, 3: Fort Mohave, 4; Gila City, 1; Grand Canyon, 1; Holbrook, 32; Huachuca Mountains, 8; Lochiel, Pima County, 6; Mohave County, opposite Needles, 19; Oracle, 1; Painted Desert, 11; Phoenix, 8; San Pedro River, 5; Sonora, Pima County, 1; Willcox, 1; Yuma, 7.

California: Adobe Station, 2;[a] Amedee, 10;[a] Ash Creek, 20; Bakersfield, 1;[a] Banning, 4; Baregas Spring, 2; Barstow, 3; Bear Valley, San Bernardino County, 10;[a] Bennett Wells, 3; Big Pine Mountain, 9:[a] Bishop Creek, 3; Blue Lake, 6;[a] Bridgeport, 1;[a] Cabezon, 1; Cameron, 2; Cameron Lake, 1; Carrizo Plains, 3;[a] Casa Diabolo, Mono County, 2;[a] Coahuila Mountain, 1; Colorado Desert, 3; Coso, 32; Coso Mountains, 2; Cuyama Valley, 3;[a] Death Valley, 8; Fort Tejon, 20;[a] Furnace Creek, 11; Granite Springs, 2; Grapevine Springs, 1; Haway

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[a] Approaching *gambeli.*

Meadows, 6; Honey Lake, 4;[a] Hope Valley, 2;[a] Hot Springs, Mono County, 2; Hot Springs Valley, 1; Independence Creek, 2; Indian Canyon, 4;[a] Inyo Mountains, 16; Keeler, 5; South Fork Kern River, 25 miles above Kernville, 18; Kernville, 5; Leavett Meadows, Mono County, 1; Little Bear Valley, San Bernardino Mountains, 14;[a] Little Owens Lake, 3; Lone Pine, 28; Long Valley, Mono County, 24;[a] Lytle Creek, 1; Mammoth, 1; Markleeville, 3;[a] Maturango Spring, 4; Menache Meadows, 6; Mesquite Valley, 1; Mohave, 13; Mohave Desert, 1;[b] Mohave River, 7; Mono Flats, Santa Barbara County, 3;[a] Mono Lake, 38;[a] Mono Pass, 5;[a] Morongo Pass, 13; Mount Pinos, 6;[a] Mount Whitney, 48; Needles, 26; Neenach, 4; Olancha, 11; Olancha Peak, 1; Onyx, 11; Oro Grande, 12; near Owens Lake, 6; head of Owens River, 1; Owens Valley, 12; Painted Rock, SE. of Simmler, 1;[a] Palm Springs, 4; Panamint, 5; Panamint Mountains, 62; Panamint Valley, 3; Pine City, 1; Pine Creek, 4; Reche Canyon, near San Bernardino, 10;[a] Resting Springs, 2; Round Valley, 1; San Antonio Mountains, 2; San Bernardino, 7; San Bernardino Mountains, 19;[a] San Bernardino Valley, 21; San Emigdio, 6;[a] San Emigdio Canyon, 8;[a] San Felipe Valley, 6; San Gorgonio Pass, 1; San Jacinto Mountains, 41;[a] San Rafael Mountains, Santa Barbara County, 14;[a] Santiago Springs, 1;[a] Saratoga Springs, 7; Squirrel Inn, 6; Susanville, 3;[a] Tehachapi, 50;[a] near Tejon Pass, 2;[a] Vallecito, Colorado Desert, 1; Victor, 1; Walker Basin, 3; Walker River. Mono County, 2;[a] Walker Pass, 5; Walters, Colorado Desert, 2; White Mountains, 3; Whitewater, 4; Woodford, Alpine County, 53; Yuma, 2.

Idaho:[c] Arco, 1; Big Butte, 2; Big Lost River, 16; Birch Creek, 13; Blackfoot, 16; Crow Creek, 1; Lemhi, 8; Montpelier Creek, 1; Pahsimeroi, 2; Sawtooth, 4; Sawtooth Lake, 12; Shoshone Falls, 5.

Lower California: Aguaje de las Fresas, 4; Cocopah Mountains, 6; Hanson Lagoon, 17; Hardy River, near Volcano Lake, 4; head of Hardy River, 1; La Grulla, 19; Poso Vicente, 1; San Matias Spring, 1; Seven Wells, 9; Vallecitos, 20.

Nevada: Anderson Ranch, Douglas County, 10; Arc Dome, 1; Ash Meadows, 10; 30 miles SW. of Austin, 3; Bijou, 2;[a] Bull Run Mountains, 2;[d] Carson, 3;[a] Carson River, 6;[a] Carson Sink, near Timber Lake, 3; Charleston Mountains, 11; Cloverdale, 1; Cottonwood Range, 8; Edgewood, 4; Elko, 1; Genoa, 1; Gardnerville, 12; Granite Creek, 6;[a] Grapevine Mountains, 30; Halleck, 5; Holbrook, 3; East Humboldt Mountains, 1; Indian Creek, 1; Lovelocks, 1; McDermitt, 1; Monitor Valley, 2; Mount Siegel, 228; Mount Sugar, 7; Mountain City, 39;[d] Oasis Valley, 4; Osobb Valley, 1; Pahranagat Valley, 4; Pahrump Valley, 1; Palisade, 4; Rabbit Hole Mountains, 2; head of Reese River, 35; Reno, 6;[a] Ruby Mountains, 3;[d] Ruby Valley, 1; near Stillwater, 14; Summit Lake, 1; Thorp Mill, 3; Vegas Valley, 11; Verdi, 8;[a] Wadsworth, 1; Washoe, 3;[a] White Rock Valley, 3; Winnemucca, 1; Winter's Mine, Douglas County, 17.

Sonora: Cienega Well, 5; Colonia Lerdo, 1; Colorado River, 20 miles S. of U. S. Boundary, 2; opposite mouth of Hardy River, 19; Santa Cruz, 4; Santa Cruz River, 29; Sierra de los Patogones, 1.

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[a] Approaching *gambeli.*

[b] Type of *deserticolus.*

[c] Nearly all Idaho specimens referable to *sonoriensis* show approach to *artemisiae.*

[d] Approaching *rufinus.*

United States and Mexican Boundary: Colorado River, at Boundary Monument No. 204, 17; San Luis Springs, Animas Valley, 4.

Utah:[a] Beaver Mountains (Puffer Lake), 4; Beaver Valley, 4; Browns Park, 2; Clear Creek, 1; Diamond Peak, 2; Fairfield, 9; Fish Lake Plateau, 2; Glenwood, 3; Hanksville, 1; Henry Mountains (Mount Ellen), 6; Kelton, 2; Laketown, 3; Loa, 4; Manti, 2; Marysvale, 5; Nephi, 11; Ogden, 4; Panguitch, 2; Panguitch Lake, 2; Parawan Mountains (Brian Head), 2; Provo, 6; St. George, 4; Salt Lake City, 13; Santa Clara, 3; Santa Clara Creek, 1; Uncompahgre Indian Reservation, 11.

PEROMYSCUS MANICULATUS COOLIDGEI THOMAS.

Peromyscus leucopus coolidgei Thomas, Ann. & Mag. Nat. Hist., ser. 7, I, p. 45, Jan. 1898.

Type locality.—Santa Anita, Lower California, Mexico.

Geographic distribution.—Greater part of the peninsula of Lower California from Cape St. Lucas northward to the vicinity of the southern base of the San Pedro Martir Mountains.

Characters.—Size slightly larger than in *P. m. gambeli*, about as in *P. m. sonoriensis;* color decidedly paler and more ochraceous than in *gambeli*, paler even than in *sonoriensis;* subterminal zone of hairs of upperparts very pale and usually considerably exposed in worn pelages; color somewhat dimorphic as in *P. m. blandus.*

Color.—Similar to that of *sonoriensis* but averaging slightly paler, especially in worn pelage. Unworn pelage, buff phase: Upperparts, head, and sides ochraceous buff lightly and uniformly mixed with dusky, producing a general effect very near to clay color; lateral line scarcely evident; ears broadly whitish distally, white spots at anterior bases conspicuous; underparts pure white; feet, forelegs, and tarsal joints white; tail sharply bicolor, grayish brown above, white below. Worn pelage, buff phase: Upperparts bright ochraceous buff very lightly mixed with cinnamon on back and rump, becoming pinkish buff on shoulders where the pale subterminal zone of the hairs is more exposed; face and nose usually pale, varying from pinkish buff to ochraceous buff; white spots in front of ears slight or obsolete. Unworn pelage, gray phase: Upperparts pale salmon buff to pinkish buff mixed with dusky, producing a general effect approaching écru drab; otherwise about as in buff phase. Worn pelage, gray phase: General effect of upperparts pale whitish écru drab lightly touched with cinnamon; pale whitish buff subterminal zone of hairs variously exposed.

Skull.—Rather variable, but not definitely distinguishable from that of *sonoriensis;* possibly averaging slightly smaller.

Measurements.—Average of 7 adults from Santa Anita, San Jose del Cabo, and Cape St. Lucas, Lower California: Total length, 171

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[a] Mostly approaching *rufinus.*

(162–178); tail vertebræ, 82 (79–86); hind foot, 21; ear from notch (dry), 16.3 (15.4–18). Average of ten adults from Santo Domingo, Lower California: Total length, 164 (158–171); tail vertebræ, 75 (70–78); hind foot, 21.9 (21.5–22).

Type specimen.—In British Museum. Collected May 21, 1896, by Dane Coolidge. Specimen in good condition.

Remarks.—Considering its distribution, it is perhaps strange that this form is not more decidedly different from *P. m. sonoriensis.* The most that can be said is that it averages paler. Many specimens are almost indistinguishable, particularly from the *sonoriensis* found in southeastern California. These, which have received the name '*deserticolus*,' may perhaps be regarded as in a slight degree intermediate between true *sonoriensis* and *coolidgei.* In worn pelage, *coolidgei* is very pale and the head and shoulders are usually of a whitish cast never seen in *sonoriensis.* Intergradation with *sonoriensis* and *gambeli* apparently takes place in the San Pedro Martir region. In this region, specimens partake of the characters of all three of the surrounding forms, *gambeli*, *sonoriensis*, and *coolidgei.* Unfortunately, two names, '*thurberi*' and '*oresterus*,' were based on specimens from this region, and as neither can be characterized they are synonymized with the forms they resemble most closely. The series representing '*thurberi*' seems to average more like *gambeli* while that representing '*oresterus*' is practically indistinguishable from *sonoriensis.* They are from localities not far apart, and when specimens in all pelages are available, they may prove to be alike, but at present the only course seems to be to dispose of them as above.

Specimens examined.—Total number 114, from localities as follows:

Lower California: Agua Dulce, 1; Calamahue, 9; Cape St. Lucas, 8; La Paz, 9; Playa Maria Bay, 9; Pozo San Augustin, 7; Rosario, 1 (approaching *sonoriensis?*); San Andres, 6; San Fernando, 3 (approaching *sonoriensis*); San Francisquito, 4; San Ignacio, 4; 20 miles west of San Ignacio, 1; San Jose del Cabo, 11; Santa Anita, 4; Santa Rosalia Bay, 15; Santo Domingo, 14; Turtle Bay (=San Bartolome Bay), 8.

PEROMYSCUS MANICULATUS MARGARITAE subsp. nov.

Type **from Margarita Island, off west coast of southern Lower California, Mexico. No. 146958, U. S. National Museum, Biological Survey Collection. ♀ adult. Dec. 1, 1905. E. W. Nelson and E. A. Goldman.**

Geographic distribution.—Known only from Margarita Island.

Characters.—Size and general characters about as in *P. m. coolidgei;* color decidedly paler, upperparts chiefly pale pinkish buff; skull short and broad.

Color.—Unworn pelage: Upperparts, sides, and head pinkish buff lightly lined with dusky, the latter scarcely modifying the general effect; sides of face, including base of whiskers, nearly clear pinkish buff; eyelids very slightly dusky; ears thinly clothed basally and more thickly distally with whitish hairs, membranous part of ears whitish basally and dusky distally; white spots at anterior bases conspicuous; underparts, nose, feet, and fore and hind legs white: hairs of throat white to roots, those of remainder of underparts with slaty basal zone relatively narrow; tail sharply bicolor, narrowly dusky above, white below. Worn pelage: General effect of upperparts very pale pinkish buff; head and shoulders distinctly whitish, produced by the exposure of the subterminal zone of the hairs; upper side of tail sometimes whitish all around on distal third.

Skull.—Similar in general to that of *P. m. coolidgei*, but averaging shorter and wider; nasals rather short and very wide.

Measurements.—Average of 10 adult topotypes: Total length 163 (157–168); tail vertebræ 77 (74–81); hind foot 21.3 (20–22); ear from notch (dry) 16.5 (14.6–17.5).

Remarks.—This mouse was found by Nelson and Goldman only on a strip of light-colored sand beach on the west side of Margarita Island. It was not obtained on other parts of the island where trapping was done. In color it is almost identical with *P. niveiventris*, which is found on similar beaches on the coast of Florida, and thus affords an excellent example of the development of like characters under like conditions. Although quite isolated and well characterized, this form seems best treated as a subspecies, since it is obviously derived from the mainland *coolidgei*, in which variation in the direction of *margaritæ* is considerable.

Specimens examined.—Total number 19, all from the type locality.

PEROMYSCUS MANICULATUS CLEMENTIS MEARNS.

Peromyscus texanus clementis Mearns, Proc. U. S. Nat. Mus., XVIII, pp. 446–447, Mar. 25, 1906.

Type locality.—San Clemente Island, off coast of southern California.

Geographic distribution.—Outer islands of the Santa Barbara group, off the coast of southern California, including San Clemente, Santa Barbara, San Nicolas, Santa Rosa, and San Miguel islands.

Characters.—Similar to *P. m. gambeli*, but averaging slightly larger and darker.

Color.—Similar to that of *P. m. gambeli*, but averaging slightly darker; ochraceous buff lateral line more distinctly marked; unworn pelage slightly darker, more vinaceous, and more mixed with dusky; worn pelage slightly deeper, more reddish colored.

Skull.—Similar to that of *P. m. gambeli*, but averaging slightly larger, and a trifle more elongate; teeth slightly heavier.

Measurements.—Average of 10 adult topotypes: Total length 164 (156–172); tail vertebræ 74 (68–78); hind foot 20.6 (20–21.5); ear from crown 15.2 (14.5–16); ear from notch (dry) 15.3 (14–17).

Type specimen.—No. 61117 U. S. National Museum. ♂ adult. Aug. 27, 1894. E. A. Mearns. Specimen in good condition.

Remarks.—This form, which occupies the outermost of the Santa Barbara Islands, is more closely similar to *gambeli*, the mainland form, than is *catalinae*, which occupies the nearer islands. The slight characters which distinguish it from *gambeli*, though not evident in every specimen, are observable in the majority of every series. Such exceedingly slight peculiarities as are found in each of the series from individual islands are scarcely tangible, so the most satisfactory arrangement seems to be the reference of all from the outer islands to one form.

Specimens examined.—Total number 136, from localities as follows:

California: San Clemente Island, 54; San Miguel Island, 25; San Nicolas Island, 22; Santa Barbara Island, 20; Santa Rosa Island, 15.

PEROMYSCUS MANICULATUS CATALINAE ELLIOT.

Peromyscus catalinae Elliot, Field Col. Mus., Chicago, Zool. Ser., III, p. 160, April, 1903.

Type locality.—Santa Catalina Island, Santa Barbara group, off the coast of southern California.

Geographic distribution.—Santa Catalina and Santa Cruz islands, Santa Barbara group, off the coast of southern California.

Characters.—Similar to *P. m. clementis*, but larger; ears larger; tail longer and coarser; skull larger and heavier.

Color.—About as in *P. m. clementis;* slightly darker and more vinaceous than in *P. m. gambeli.*

Skull.—Similar to that of *P. m. clementis*, but decidedly larger and heavier; zygomata very heavy and deeply notched anteriorly; nasals very broad and slightly concave anteriorly; audital bullæ actually and relatively larger; molar teeth large.

Measurements.—Type: Total length 176; tail vertebræ 92; hind foot 23; ear from notch 18. Average of ten adults from Santa Cruz Island: 196 (185–214); 96 (88–105); 22 (21–23); 15.7 (15–16.8).

Type specimen.—No. 11017 Field Museum of Natural History, Chicago. ♂ adult. Feb. 6, 1903. J. Rowley. Skin in good condition; skull with vault of cranium broken.

Remarks.—This form differs decidedly from *P. m. gambeli*, and fully adult specimens almost equal *P. boylei* in size and length of tail. Most of the specimens available are in ragged worn pelage, so that it is difficult to ascertain to what degree the form may be characterized by color, but apparently it does not differ greatly, if at all, from *P. m. clementis*. Specimens from Santa Catalina and Santa Cruz islands appear to be practically identical, notwithstanding the fact that both islands are nearer to islands inhabited by *P. m. clementis* than to each other. The Santa Cruz Island specimens appear to have slightly smaller ears than those from Santa Catalina.

Specimens examined.—Total number 50, from localities as follows:

California: Santa Catalina Island, 25; Santa Cruz Island, 25.

PEROMYSCUS MANICULATUS DUBIUS ALLEN.

Peromyscus dubius Allen, Bull. Am. Mus. Nat. Hist., N. Y., X, pp. 157-158, April 12, 1898.

Type locality.—Todos Santos Island, off west coast of northern Lower California, Mexico.

Geographic distribution.—Known from Todos Santos and Coronados islands off west coast of northern Lower California, Mexico.

Characters.—Size large, decidedly larger than *P. m. gambeli;* hind foot equaling that of *P. m. catalinae*, tail and ears relatively shorter; color dark.

Color.—Similar in general to that of *gambeli*, *catalinae*, and *geronimensis* but darker and richer. Worn pelage: General effect of sides and rump rich russet, becoming nearly Mars brown in middle of back; head and shoulders cinnamon to russet, slightly grizzled with dusky; ears dusky brownish, rather broadly edged with whitish; underparts buffy white; tail sharply bicolor.

Skull.—Large and heavy, nearly or quite equaling that of *catalinae* and decidedly exceeding that of *gambeli;* posterior palatine foramina very large; zygomata slightly notched anteriorly; teeth relatively large.

Measurements.—Average of 5 adult topotypes: Total length, 186 (176–195); tail vertebræ, 84 (77–92); hind foot, 21 (20–22); ear from notch (dry), 15.5 (14.6–17.4).

Type specimen.—No. $\frac{13586}{11935}$ American Museum of Natural History, New York. ♂ adult. Mar. 11, 1897. A. W. Anthony. Specimen in good condition.

Remarks.—The mice of the *maniculatus* group on the islands off the west coast of southern and Lower California are all of one general type and all differ from the mainland form *gambeli* in being larger and more robust. The distinctions separating the various forms in this insular series are slight. Beginning at the north, *catalinae* is distinguished chiefly by its long tail and ears; next comes *dubius*, in which the tail is slightly shorter and the color darkest of all; then follows *geronimensis*, which is very like *dubius* except in its paler color, and then *cineritius*, which is the palest form. Any one of these forms may be separated from *gambeli* by larger size. Specimens from the Coronados Islands are exactly like topotypes of *dubius* in color, and their skulls differ only in having the zygomata slightly less notched anteriorly.

Specimens examined.—Total number 68, from localities as follows:

Lower California: Coronados Islands, 45; Todos Santos Island, 23.

PEROMYSCUS MANICULATUS GERONIMENSIS ALLEN.

Peromyscus geronimensis Allen, Bull. Am. Mus. Nat. Hist., N. Y., X, p. 156, Apr. 12, 1898.

Peromyscus exiguus Allen, *supra cit.* p. 157—San Martin Island, Lower California.

Type locality.—San Geronimo Island, off west coast of Lower California, Mexico.

Geographic distribution.—Known from various islands off the west coast of the northern half of Lower California, including San Martin, San Geronimo, and Natividad islands.

Characters.—Similar in size and general characters to *P. m. dubius*, but color paler; similar in color to *P. m. gambeli*, but size decidedly larger.

Color.—About as in *gambeli*, possibly averaging slightly paler, thus approaching the color of *sonoriensis;* upperparts, head, and sides ochraceous buff, lightly and uniformly mixed with dusky; ears extensively whitish distally, brownish dusky proximally; white spot at anterior bases usually prominent; underparts creamy white; feet white, without dusky markings on tarsal joint; tail sharply bicolor.

Skull.—Rather variable, but averaging practically as in *P. m. dubius.*

Measurements.—Average of 10 adult topotypes: Total length, 178 (170–182); tail vertebræ, 81 (79–85); hind foot, 22.4 (21–23); ear from notch (dry), 16 (14.5–17.3). Average of 10 adults from San Martin Island: Total length, 170 (163–181); tail vertebræ, 78.5 (70–82).

Type specimen.—No. $\frac{13616}{11960}$ American Museum of Natural History, New York. ♂ adult. March 17, 1897. A. W. Anthony. The above is the number originally published as that of the type but the specimen now bearing a type label does not have this number.

Remarks.—This form agrees with *dubius* and *cineritius* in size and proportions but differs in color, being paler than *dubius* and decidedly less grayish and more ochraceous than *cineritius.* Specimens from San Geronimo Island have skulls with nasals averaging slightly more slender than in those from San Martin Island, but variation is so great that there seems to be no safe basis for separating them. Specimens from Natividad differ only in a slight approach toward the paleness of *cineritius.*

Specimens examined.—Total number 220, from localities as follows:

Lower California: Natividad Island, 21; San Geronimo Island, 142; San Martin Island, 57.

PEROMYSCUS MANICULATUS CINERITIUS ALLEN.

Peromyscus cineritius Allen, Bull. Am. Mus. Nat. Hist., N. Y., X, p. 155, April 12, 1898.

Type locality.—San Roque Island, off Lower California, Mexico.

Geographic distribution.—Confined to San Roque Island.

Characters.—Size, proportions, and cranial characters about as in *geronimensis;* color slightly less dusky and general effect much grayer; buffy ochraceous tints minimized.

Color.—Unworn pelage: General effect of upperparts pale drab (Ridg. Pl. III, No. 18); ground color pale écru drab uniformly mixed with dusky; lateral line scarcely evident except in interfemoral region about the base of the tail, where it is fairly well marked and of a rather lively pinkish buff color; a very small dusky spot at base of whiskers; orbital ring scarcely evident, or, at most, confined to the eyelids; ears dusky rather broadly edged with whitish; underparts yellowish white; tail sharply bicolor, dusky brownish above, white below; feet white with a dusky marking on the tarsal joint.

Skull.—Practically as in *geronimensis;* braincase apparently slightly lower and flatter; zygomata possibly more angular anteriorly.

Measurements.—Type: Total length 191; tail vertebrae 83; hind foot (dry) 21.8. Average of three adult topotypes: Total length 175 (171–184) tail vertebræ 76 (75–78).

Type specimen.—No. $\frac{13589}{11938}$, American Museum of Natural History, New York. ♂ adult. June 21, 1897. A. W. Anthony. Skin in fair condition. Skull in good condition but molariform teeth absent except right $\underline{m}1$ and left $\overline{m1}$ and m2.

Remarks.—This is one of the best marked of the Pacific Coast insular forms. It is readily distinguishable from all others known, by its pale grayish-drab color. The color is somewhat similar to that of adolescents of other forms, but no specimens are at hand that are exactly like it. It may possibly possess certain average cranial characters, but with a very limited representation of it, this can not now be determined.

Specimens examined.—Total number 9, all from the type locality.

PEROMYSCUS MANICULATUS MAGDALENAE subsp. nov.

Type from Magdalena Island, off west coast of southern Lower California, Mexico. No. 146971 U. S. National Museum, Biological Survey Collection. ♂ old. Dec. 3, 1905. E. W. Nelson and E. A. Goldman.

Geographic distribution.—Magdalena Island and a narrow strip of the adjacent mainland of the peninsula of Lower California.

Characters.—Most similar to *P. m. geronimensis*, but larger and with a slightly longer tail; color slightly darker and more tawny; decidedly larger and darker than in *coolidgei* and *margaritae.*

Color.—Similar to that of *P. m. geronimensis*, but averaging slightly darker and more tawny. No. 146972, slightly worn pelage: Upperparts between ochraceous buff and vinaceous cinnamon lightly mixed with dusky, the latter somewhat heavier on dorsum; face and head very slightly paler than sides; eyelids dusky; ears dusky broadly edged with white; underparts creamy white.

Skull.—Practically as in *P. m. geronimensis*; braincase averaging slightly broader; zygomata not so deeply notched anteriorly.

Measurements.—Average of 7 adult topotypes: Total length 184 (175–200); tail vertebræ 88 (82–96); hind foot 22.8 (22–23); ear from notch (dry) 16.6 (15.5–17.8).

Remarks.—Although the characters are slight, the isolation of this form seems to warrant recognition. The form is apparently surrounded by *P. m. coolidgei*, from which it is quite distinct, while it is very similar to the isolated and geographically distant *geronimensis.* It occurs on the mainland of the peninsula as well as on the island, and quite probably intergrades with *coolidgei.* The island is but narrowly separated from the peninsula and at low tide the amount of intervening water is said to be so little at some points as to be easily fordable.

Specimens examined.—Total number 19, from localities as follows:

Lower California: Magdalena Island, 9; Matancita, 2; San Jorge, 7; San Juanico Bay, 1.

PEROMYSCUS SITKENSIS MERRIAM.

(Pl. II, fig. 7.)

Peromyscus sitkensis Merriam, Proc. Biol. Soc. Wash. XI, p. 223, July 15, 1897.

Type locality.—Sitka, Baranof Island, Alaska.

Geographic distribution.—Baranof and Chichagof islands, Alaska.

Characters.—Similar in color and general characters to *hylaeus* and *macrorhinus* but decidedly larger than either, though exceeding *macrorhinus* much less than *hylaeus;* skull very large and heavy, larger than that of any other species of the subgenus *Peromyscus* found north of Mexico.

Color.—Much as in *macrorhinus*, *hylaeus*, *keeni*, etc. Worn pelage: Sides rich russet or Mars brown, shading on dorsum to Prout brown and sometimes burnt umber; dusky markings about face, forearms, and ankles well developed; very little or no white at anterior bases of ears. Adolescent pelage: General effect on sides isabella color lightly tinged with dusky; dorsum usually darker than sides.

Skull.—Most similar to that of *macrorhinus*, from which it differs chiefly in larger size; nasals and rostrum very long; zygomata somewhat compressed anteriorly; teeth rather large; audital bullæ relatively small.

Measurements.—Average of ten adult topotypes: Total length 224; tail vertebræ 113.6; hind foot 26.5; ear from notch (dry) 16.5 (14.9–17.8).

Type specimen.—No. 73809 U. S. National Museum, Biological Survey collection. ♂ adult. July 30, 1895. C. P. Streator. Specimen in good condition.

Remarks.—*P. sitkensis* is closely allied to the species *maniculatus*, and though apparently distinct, extremes of variation show a marked approach to *macrorhinus*. From present material, however, it seems that the ranges of *macrorhinus* and *sitkensis* are not continuous, and it is therefore probable that if *sitkensis* intergrades with any member of the group it is with *hylaeus*. *P. m. sitkensis* is decidedly the largest member of the *maniculatus* group, and in other groups found north of Mexico it has no rival in size except *P. californicus*, with which close comparison is not necessary. Specimens from Chichagof Island are almost identical with topotypes, merely averaging a trifle smaller.

Specimens examined.—Total number 54, from localities as follows:

Alaska: Sitka, Baranof Island, 35; Tenakee Inlet, Chichagof Island, 19.

PEROMYSCUS SITKENSIS PREVOSTENSIS Osgood.

Peromyscus prevostensis Osgood, N. Am. Fauna No. 21, pp. 29–30, Sept. 1901.

Type locality.—Prevost Island, Queen Charlotte Group, British Columbia.

Geographic distribution.—Prevost Island.

Characters.—Similar to *sitkensis*, but with slightly shorter tail and slight cranial characters. Somewhat similar to *macrorhinus*, but hind foot longer and tail shorter; skull decidedly larger and heavier.

Color.—Similar to *sitkensis* and *macrorhinus*, but averaging slightly darker. Sides rich Mars brown shading into a broad irregular area of mummy brown on dorsum; dusky orbital ring and spot at base of whiskers very broad and scarcely separated, sometimes confluent; ears dusky, narrowly edged with whitish, no white at anterior bases; underparts grayish white, occasionally with a faint wash of pinkish buff on middle of breast; forearms to wrist same color as sides, hands white; 'ankles' dusky brownish posteriorly or sometimes all around; hind feet usually white, lightly washed with dusky brownish to bases of toes; tail dark brown above, white below.

Skull.—Similar to that of *sitkensis*, but slightly heavier; nasals averaging shorter and not so attenuate posteriorly; posterior palatine foramina nearly or fully twice as long as in *sitkensis*, forming distinct slits rather than nearly round punctures.

Measurements.—Average of 47 adult topotypes: Total length 217 (205–230); tail vertebræ 104 (97–116); hind foot 26 (25–27); ear from notch (dry) 15.6 (14.4–16.4).

Type specimen.—No. 100818 U. S. National Museum, Biological Survey collection. ♀ adult. July 5, 1900. W. H. Osgood and E. Heller. Specimen in good condition.

Remarks.—Since this form was described, 2 specimens referable to it have been received from Forrester Island, Alaska, a small islet off the southwest coast of Prince of Wales Island. Specimens of typical *sitkensis* also have been obtained from Chichagof Island, Alaska. The known distribution of *sitkensis* and its one closely allied subspecies is therefore curiously interrupted and quite independent of its nearest relatives (*macrorhinus*, *hylaeus*, and *keeni*), although so far as yet known *sitkensis* wherever found occurs alone. Thus in the long distance from Baranof and Chichagof islands to Forrester Island are several islands inhabited apparently by *hylaeus* alone. In the same way the large islands of the Queen Charlotte group (Graham and Moresby) inhabited only by *P. m. keeni* intervene between Forrester Island and Prevost Island.

Specimens examined.—Total number 49, from localities as follows:

Alaska: Forrester Island, 2.
British Columbia: Provost Island, Queen Charlotte Islands, 47.

Key to subspecies of Peromyscus polionotus.

a. Hairs of underparts chiefly white to roots.
  b. Size smaller; total length usually less than 130; color slightly darker. Western Florida.
    1. Nose with a white stripe; or if not, thighs white all around_______*P. p. albifrons*
    2. Nose without white stripe; thighs fulvous on inner side___________*P. p. rhoadsi*
  bb. Size larger; total length usually more than 130; color slightly paler. Eastern Florida.
    c. Color very pale; white of underparts usually reaching lower border of eye; white spots above eyes conspicuous. Anastasia Island__*P. p. phasma*
    cc. Color not so pale; white of underparts usually not reaching lower border of eye; white spots above eyes usually obsolete. Mainland of Florida. *P. p. niveiventris*
aa. Hairs of underparts chiefly slaty at bases_____ ___ _________________*P. polionotus*

PEROMYSCUS POLIONOTUS (WAGNER).

(Pl. II, fig. 11.)

Mus polionotus Wagner, Archiv. f. Naturg. v. Wieg., II, p. 52, 1843.

Sitomys niveiventris subgriscus Chapman, Bull. Am. Mus. Nat. Hist., N. Y., V, p. 341, Dec. 22, 1893.

Peromyscus subgriscus subgriscus Bangs, Proc. Bost. Soc. Nat. Hist., XXVIII, p. 200, March, 1898.

Peromyscus subgriseus arenarius Bangs, *supra cit.*, pp. 202–203, 1898—Hursman Lake, Scriven County, Georgia—not *P. eremicus arenarius* Mearns 1896.

Peromyscus subgriseus baliolus Bangs, Science, N. S., VIII, pp. 214–215, Aug. 19, 1898—new name for *P. s. arenarius* Bangs, preoccupied.

Peromyscus polionotus Osgood, Proc. Biol. Soc. Wash., XX, p. 49, 1907.

Type locality.—Georgia.

Geographic distribution.—Open fields of the interior of northern Florida and southern Georgia.

Characters.—Similar in general to *P. m. pallescens* and *P. m. bairdi*, but even smaller—much smaller than any other species of the Atlantic States. Hairs of underparts slaty gray at base except on chin and throat where they are white to roots; tail definitely bicolor.

Color.—Unworn pelage: Upperparts nearly uniform brownish fawn; ground color dark fawn finely mixed with brownish dusky which is slightly concentrated on dorsum; sides of face and orbital region inclining to brighter fawn; narrow orbital ring dusky; ears dusky, whitish edged, decidedly darker than in *niveiventris;* subauricular tufts fawn and whitish or entirely like rest of upperparts; feet and forelegs white; underparts creamy white, hairs white to bases on chin and throat, slaty gray at bases elsewhere; tail decidedly bicolor, dusky brown above, white below. Worn pelage: Sides between fawn and cinnamon, rather brighter than either; back darker, almost Prout brown; otherwise similar to unworn pelage. Adolescent pelage: Sides broccoli brown tinged with fawn, nearly like écru drab, middle of back much darker, blackish hair brown.

Skull.—Similar in general to that of *P. m. bairdi*, but slightly shorter; palatine slits in particular, shorter; audital bullæ slightly larger; skull incomparably smaller than that of *P. gossypinus* or any other species of the Atlantic coast region.

Measurements.—Average of 5 adults from Gainesville, Fla.: Total length, 130 (125–137); tail vertebræ, 47 (41–52); hind foot (dry), 16.6 (15.6–17.7); ear from notch (dry), 13 (12–13.4). Average of 10 adults from Hursman Lake, Georgia: 126; 46.5; 16.5.

Type specimen.—Wagner's original type of this species, as elsewhere stated (Proc. Biol. Soc. Wash., XX, p. 49, 1907), is still mounted and on exhibition in the museum of the Polytechnic in Zurich, Switzerland. Considering its long exposure, it is fairly well preserved, and its identity with the mouse that has been currently known as *subgriseus* is obvious. The color is not greatly changed, the back being dull brownish and the sides tinged with fawn, while the narrow whitish edgings on the ears are still evident, and the underparts are white. The skull is contained in the skin, and the ungrooved upper incisors are plainly visible. The tail vertebræ also are present. The rough measurements of the mounted specimen are: Head and body, 55.5; tail vertebræ, 33; hind foot, 17.6; ear from notch, 10. On the stand are several labels pasted one upon another. The outer and most recent one is inscribed "*Mus polionotus.* Graurückige Maus. N. Amerika." On removing this the next was exposed as follows: "*Mus polionotus.* Die graurückige Maus. Nordamerika. Georgien." This was in the hand of a museum director, who I was informed had died in 1865. The undermost label was not fully legible, but the following in the hand of Schinz could be seen: "*Mus poliono- Nordamer.*" It would seem therefore that this specimen must be the one examined and named by Wagner in 1843. A few lines by Schinz[a] bearing on the question are as follows: "Diese kleine Maus ist neu. Wagner benannte sie nach dem im Zurcher Museum befindlichen Exemplar."

Remarks.—*P. polionotus* is the representative of a small group of closely allied forms, all of very small size and of limited distribution in Florida and Georgia. As a group it is so distinct from all its congeners of the Atlantic slope as not to require close comparison. Its relationship seems to be with the *maniculatus* group, as represented by *bairdi* and *pallescens*. *P. polionotus* is very similar to *pallescens*, and if their ranges were continuous intergradation might well be expected.

Although *niveiventris* and *phasma* are slightly larger and apparently isolated from the smaller *polionotus* and *rhoadsi*, the relationship of all four is so close that it seems best to treat them as subspecies. Specimens from Gainesville, Fla. (*subgriseus*), are intermediate in color between *niveiventris* and *polionotus*, and the difference in size is so slight and so nearly bridged by individual variation that it seems very probable that intergradation to the last degree will yet be found.

Specimens examined.—Total number 108, from localities as follows:

Florida: Blitch Ferry, 1; Gainesville, 45.
Georgia: Butler, 24; 'Georgien,' 1 (type); Hursman Lake, 37.

PEROMYSCUS POLIONOTUS NIVEIVENTRIS (CHAPMAN).

Hesperomys niveiventris Chapman, Bull. Am. Mus. Nat. Hist., N. Y., II, p. 117, June, 1889.
Peromyscus niveiventris Bangs, Proc. Biol. Soc. Wash., X, p. 122, 1896.

Type locality.—East Peninsula, opposite Micco, Fla.

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[a] Syn. Mamm., II, p. 177, 1845.

Geographic distribution.—Sandy beach region of the eastern coast of Florida.

Characters.—General characters much as in *polionotus* but size slightly larger and color paler; color of upperparts chiefly pale ochraceous buff, underparts creamy white to roots of hairs.

Color.—Unworn pelage: Ground color of upperparts pale ochraceous buff, brighter on head and back and paler across shoulders and nape; upperparts with a fine delicate mixture of brownish dusky throughout but not greatly modifying the buffy which dominates the general effect; underparts pure creamy white to roots of hairs; white of underparts extending well up on sides, sometimes produced so as to reach the lower edge of the eye; white of sides near lateral line not extending to roots of hairs which are slaty gray at base like those of the upperparts; ear conch dusky, thinly clothed with buffy white hairs; subauricular tufts chiefly buffy, but with a few dusky and a few white hairs; feet and fore legs white; hind legs white except a pale buffy area from 'ankle' to body; tail indistinctly bicolor, buffy white below and on sides, pale brownish buff on top. Worn pelage: Similar to unworn pelage but brighter with dusky tone entirely eliminated, hairs tipped with rusty, tail very indistinctly bicolor. Young in first coat: General effect of upperparts smoke gray produced by slate gray underfur overcast by buffy white. Adolescents: Darker and more grayish than adults, otherwise similar.

Skull.—Essentially as in *P. polionotus*, but larger; molar teeth larger.

Measurements.—Average of 10 adult topotypes: Total length, 139 (128–153); tail vertebræ, 52 (50–60); hind foot, 18.1 (17–19); ear from notch (dry), 12.4 (11.6–13.5).

Type specimen.—No. $\frac{1762}{1042}$ American Museum of Natural History, New York. ♂ adult. March 3, 1889. F. M. Chapman. Skin in fair condition; skull with right zygoma somewhat broken but repaired so that no parts are missing.

Remarks.—The range of *niveiventris* as worked out by Bangs is very limited, including only the narrow strip of beach on the eastern coast of Florida where sea oats (*Uniola*) grow. This, however, does not of necessity preclude the possibility of intergradation with *polionotus*, the range of which is often interrupted, as is that of *bairdi*, which covers a wide area, but only on prairies and uplands, so that many small colonies are considerably isolated.

The color of the underparts in *niveiventris*, *phasma*, *albifrons*, and *rhoadsi*—white to the roots of the hairs—is unique within the genus with one exception. This is *P. l. ammodytes* from Monomoy Island, Massachusetts, which also lives on sandy beaches near salt water. *P. m. margaritae* from Lower California also shows much superficial resemblance to it. Such parallel development from the same apparent causes suggests that purely physical processes may have determined it.

Specimens examined.—Total number 188, from localities as follows:

Florida: Canaveral, 8; Hillsboro Inlet, Dade County, 2; Jupiter Island, 22; Lake Worth, 3; Oak Lodge, opposite Micco, 149; Palm Beach, 4.

PEROMYSCUS POLIONOTUS PHASMA Bangs.

Peromyscus phasma Bangs, Proc. Bost. Soc. Nat. Hist., XXVIII, pp. 199–200, March, 1898.

Type locality.—Point Romo, Anastasia Island, Florida.

Characters.—Similar in size to *niveiventris*, but pallid color much accentuated; white markings more extensive; nose and spots over the eyes and at base of ears pure white and very conspicuous.

Color.—Upperparts pinkish buff with a grayish tinge in the middle of the back; nose, a spot above the eye, and a spot at the base of the ear white; underparts pure white to the roots of the hairs, the white extending farther up on the sides than in *niveiventris;* feet and both fore and hind legs pure white all around; tail white, unicolor, or with faint traces of dusky on the upper side; ears grayish white within and without.

Skull.—As in *P. p. niveiventris.*

Measurements.—Average of 10 adult topotypes: Total length 138.5; tail vertebræ 53.5; hind foot 18.7; ear from notch 14.

Type specimen.—No. 7173 Museum of Comparative Zoology, Cambridge, Mass.; formerly in collection of E. A. and O. Bangs. ♂ adult. Feb. 14, 1897. O. Bangs. Skin practically perfect; skull without first upper molar, otherwise perfect.

Remarks.—This form shows an extreme of paleness. It is thus quite the antithesis of *polionotus.* In general terms, therefore, *niveiventris* is intermediate in color between *phasma* and *polionotus.* Although individual variation in *niveiventris* does not reach the normal type of *phasma*, variation in that direction is not infrequent, as shown by certain specimens with incipient white superciliary spots and the white of the underparts extending to the lower margin of the eye.

Specimens examined.—Total number 54, all from the type locality.

PEROMYSCUS POLIONOTUS RHOADSI Bangs.

Peromyscus subgriseus rhoadsi Bangs, Proc. Bost. Soc. Nat. Hist., XXVII, pp. 201–202, March, 1898.

Type locality.—Head of the Anclote River, Hillsboro County, Fla.

Geographic distribution.—West central Florida, in the vicinity of Tampa Bay.

Characters.—Similar to *P. niveiventris*, but size smaller; color averaging slightly darker; hairs of underparts white to roots or very slightly slaty at bases.

Color.—Similar in general to that of *niveiventris*, but averaging darker, thus being intermediate between *niveiventris* and *polionotus*. Type in slightly worn pelage (May): Upperparts, sides, head, cheeks, etc., rather dark ochraceous buff (slightly deeper colored than in *niveiventris*), sparingly mixed with dusky; underparts creamy white. locally with traces of pale slaty at bases of hairs; ears rather darker than in *niveiventris;* feet white; tail white above and below distally, narrowly brownish buffy above proximally for about half its length.[a] Unworn pelage (as partially indicated by available material): Similar to that of *niveiventris*, but slightly darker and more grayish.

Skull.—Similar to that of *niveiventris* and *polionotus*, but smaller than in either.

Measurements.—Type: Total length 124.5; tail vertebræ 46; hind foot 16.5. Average of 10 adults from Tarpon Springs, Fla., and vicinity: 126; 47; 17.

Type specimen.—No. 6980 Museum of Comparative Zoology, Cambridge, Mass., formerly in collection of E. A. and O. Bangs. ♂ adult, old. May 23, 1895. W. S. Dickinson. Skin in fair condition. Skull perfect, except for a slight break in the left audital bulla; crowns of molars greatly worn.

Remarks.—As suggested by Bangs, this form may range throughout southwestern Florida. Its relationship to *polionotus* is close, and specimens having some slaty gray at the bases of the hairs of the underparts are not uncommon even among those from the vicinity of the type locality. Except for its small size, its characters are intermediate between those of *niveiventris* and *polionotus*. Specimens from Citronelle, although strongly approaching *polionotus*, seem better referable to *rhoadsi*.

Specimens examined.—Total number 23, from localities as follows:

Florida: Head of Anclote River, 6; Citronelle, 2; Cootie River, 4; Tarpon Springs, 11.

PEROMYSCUS POLIONOTUS ALBIFRONS subsp. nov.

Type from Whitfield, Fla. No. 1297 Carnegie Museum, Pittsburg, Pa. ♀ adult. Apr. 17, 1903. W. E. Clyde Todd.

Geographic distribution.—Coast of western Florida and Alabama.

Characters.—Similar to *P. p. rhoadsi*, but white of underparts more extensive; end of nose and narrow stripe extending nearly to interorbital region white or whitish; white of underparts reaching lower border of eye; thighs whitish with little or no extension of body color on inner sides.

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[a] Specimens having the tail entirely unicolor are to be found as in *niveiventris;* in the type of *rhoadsi* the upper and lower sides of the tail were reversed in preparing the specimen and the color of the natural upper side is easily overlooked.

Color.—General color of upperparts much as in *P. p. rhoadsi;* back and sides in slightly worn pelage (April) grayish fawn; hairs of underparts white to roots or very slightly plumbeous at bases; end of nose white and thence narrowly white or whitish on median line to the lower forehead between the eyes; white of underparts extending to lower border of eye; feet and legs white all around, thighs without extension of body color; ears broadly edged with white and with a few white hairs at bases; tail white all around except basal third or fourth, the upper side of which is pale grayish brown.

Skull.—Similar to that of *P. p. rhoadsi*, but slightly larger; molar teeth slightly larger.

Measurements.—Average of 10 adult topotypes: Total length 130 (122–136); tail vertebræ 49 (44–53); hind foot 17.5 (17–19).

Remarks.—So little mammal collecting has been done in the eastern Gulf States, except in peninsular Florida, that the discovery of this well-marked form in the western or 'panhandle' part of Florida is not surprising. It was first received from W. E. Clyde Todd, Assistant Curator, Section of Vertebrate Zoology, Carnegie Museum, who collected the type series. Later, specimens were secured on the coast of Alabama by A. H. Howell of the Biological Survey.

Specimens examined.—Total number 19, from localities as follows:

Alabama: Bon Secour, 6.[a]
Florida: Whitfield, 13.

PEROMYSCUS MELANOTIS ALLEN AND CHAPMAN.

Peromyscus melanotis Allen and Chapman, Bull. Am. Mus. Nat. Hist., N. Y., IX, p. 203, June 16, 1897.

Peromyscus cecilii Thomas, Ann. & Mag. Nat. Hist., Lond., Ser. 7, XI, pp. 486–487, May, 1903—Santa Barbara Camp, S. slope Mount Orizaba, Puebla, Mexico.

Peromyscus melanotis zamelas Osgood, Proc. Biol. Soc. Wash., XVII, p. 59, Mar. 21, 1904—Colonia Garcia, Chihuahua, Mexico.

Type locality.—Las Vigas, Veracruz, Mexico. Altitude, 8,000 feet.

Geographic distribution.—Higher slopes of the principal mountains of Mexico north of the States of Guerrero and Oaxaca. Extending along the Cordillera of Veracruz; westward from Mount Popocatepetl to the Sierra Nevada de Colima, and northward into the Sierra Madre of Durango and Chihuahua. Transition and Canadian zones, from 7,000 feet to 12,000 feet altitude.

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[a] Received too late for use in connection with the distribution map (Plate I).

Characters.—Size small; tail very short; pelage usually very long and lax. Most similar to *P. m. labecula*, but slightly smaller; braincase broader and more rounded; rostrum decidedly longer and more slender.

Color.—Winter pelage: Sides and most of upperparts tawny ochraceous lightly lined with dusky; median dorsal area between shoulders and rump distinctly darker than rest of upperparts, but always mixed dusky and tawny; lower cheeks and narrow lateral line tawny ochraceous; a very narrow dusky orbital ring; ears dusky brownish with whitish edgings; ear tufts not prominent, same color as surrounding parts; a very small dusky spot at base of whiskers; underparts pure white; hands and feet white; outer side of 'ankles' dusky brownish; tail very sharply bicolor, sooty brownish above, white below. Summer pelage: Sides tawny ochraceous, clouded with sooty; middle of back, from shoulders to base of tail, nearly black, with only slight mixture of tawny; dusky markings more extensive than in winter pelage, otherwise similar. Young: Sides pale hair brown overlaying deep slate color; middle of back blackish slate; underparts washed with white.

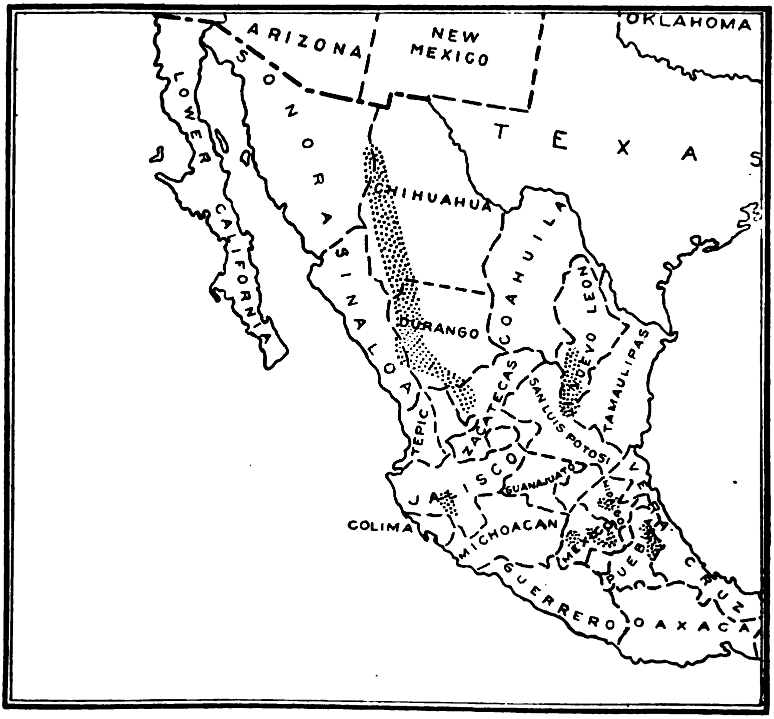

Fig. 1.—Distribution of *Peromyscus melanotis*.

Skull.—About the size of that of *P. m. sonoriensis;* characterized chiefly by long, slender rostrum and nasals, decidedly longer than in *P. m. fulvus* or *P. m. labecula;* nasals more compressed posteriorly; braincase more rounded; interorbital space narrower; prezygomatic notch less prominent; audital bullæ slightly smaller; teeth about as in *P. m. fulvus*, smaller than in *labecula.*

Measurements.—Adult ♂, topotype: Total length, 148; tail vertebræ, 58; hind foot, 21. Average of 6 adults from Perote and Cofre de Perote, Veracruz: 155 (132–168); 64 (58–66); 20.7 (20–21.5); ear from notch (dry), 18 (17–19.2). Of 5 from Mount Orizaba: 164.4 (155–172); 71.8 (64–79); 21.7 (21–23). Of 10 from Mount Tancitaro, Michoacan: 167 (160–175); 77.5 (71–81); 21.5 (21–22).

Type specimen.—No. $\frac{12617}{10822}$ American Museum of Natural History, New York. ♂ adult. April 30, 1897. F. M. Chapman. Specimen in good condition. Skin in "left over" winter pelage, quite pale, with very little black on dorsum.

Remarks.—The small size and short tail of *P. melanotis* distinguish it from all other Mexican species except those of the *maniculatus* and *leucopus* groups. From the species of both of these groups it differs in cranial characters, particularly in the length and slenderness of the rostrum. Its long full pelage and short, sharply bicolor tail readily distinguish it from *texanus*, *mesomelas*, etc. It does not have the conspicuous ear tufts of *labecula* and *fulvus*, and its ears are larger and darker than in either of these. Nevertheless, specimens in certain pelages are not always distinguishable by external characters except size. It is found at high altitudes on most of the loftier mountains of central Mexico, and, though absolutely isolated in many such places, it shows remarkably little deviation from one general type. The variation is so slight that there seems to be no logical basis for the separation of local forms. The species shows considerable seasonal variation, however. In most Mexican species change of pelage seems to be irrespective of season. In this mountain species, however, distinct winter and summer pelages occur. As no specimens taken at one locality at different seasons are available, it is difficult to be sure that there are two yearly molts in this species, but the present material seems to indicate two. At any rate, all the winter specimens are in a relatively light-colored pelage and all the summer ones are in a darker pelage. Moreover, spring (May) specimens from Cofre de Perote, Veracruz, are changing from a worn, light-colored pelage to a fresh dark state, while fall (October) specimens from Salazar, Mexico, show a worn, dark pelage, which is being replaced by a fresh, light-colored one. *P. cecilii* was based on specimens of *P. melanotis* in summer pelage. Specimens taken in April on the west slope of Mount Orizaba at an elevation of 9,500 feet are in somewhat worn winter pelage, and show very little black. They do not differ from ordinary *melanotis* from numerous localities. There is only slight variation in cranial characters. Specimens from

Mount Tancitaro are a trifle larger and have rather wider nasals than usual. Similar specimens may be found in any good series from elsewhere. The molar teeth are somewhat larger than usual in series from Ajusco and Salazar, Mexico. The specimens representing the supposed form '*zamelas*' are very extensively black and are from a region greatly removed from the type locality of *melanotis*, but probably represent the extreme phase of the ordinary summer pelage.

Specimens examined.—Total number 203, from localities in Mexico, as follows:

Chihuahua: Colonia Garcia, 8; Sierra Madre near Guadalupe y Calvo, 18.
Durango: Coyotes, 8; near El Salto, 5; near Guanacevi, 3.
Hidalgo: Sierra de Pachuca, 3; Tulancingo, 1.
Jalisco: Sierra Nevada de Colima (12,000 feet), 8.
Mexico: Ajusco, 14; southwest slope Mount Iztaccihuatl (13,500 feet), 3; north slope Mount Popocatepetl (11,500 feet), 12; Salazar, 28; north slope Volcan Toluca, 15.
Michoacan: Mount Tancitaro (12,000 feet), 27.
Morelos: Huitzilac, 6.
Puebla: West slope Mount Orizaba (9,500 feet), 7; Mount Orizaba, 15.
Tamaulipas: Miquihuana, 1.
Veracruz: Cofre de Perote (12,500 feet), 10; Las Vigas, 3; Perote, 1; Santa Barbara Camp, Mount Orizaba, 3.
Zacatecas: Valparaiso Mountains, 4.

Key to subspecies of Peromyscus leucopus.

a. Habitat north of Mexico.
  b. Hairs of underparts chiefly white basally. Monomoy Island, Massachusetts. *P. l. ammodytes*
  bb. Hairs of underparts chiefly slaty basally.
    c. Color largely tawny or ochraceous buff. Chiefly eastern and northern.
      d. Size large; hind foot 22–24; greatest length of skull usually more than 27; rostrum and nasals longer. Marthas Vineyard, Massachusetts. *P. l. fusus*
      dd. Size smaller; hind foot 20–23; greatest length of skull usually less than 27; rostrum and nasals shorter.
        e. Color darker, usually with a well-differentiated dorsal stripe. Chiefly east of the 100th meridian.
          1. Color darker; size smaller. Southern---------- *P. leucopus*
          2. Color paler; size larger. Northern---------- *P. l. noveboracensis*
        ee. Color paler, usually with dorsal stripe only slightly developed or absent. Chiefly west of the 100th meridian.
          1. A slight dorsal stripe usually evident---------- *P. l. aridulus*
          2. No dorsal stripe evident---------- *P. l. ochraceus*
    cc. Color largely fawn or vinaceous cinnamon. Chiefly Texas, New Mexico, and Arizona.
      d. Size larger; hind foot 21–24; molars larger; maxillary toothrow about 4.
        e. Color paler---------- *P. l. tornillo*
        ee. Color slightly darker---------- *P. l. arizonæ*
      dd. Size smaller; hind foot 20–23; molars smaller; maxillary toothrow less than 4---------- *P. l. texanus*
aa. Habitat Mexico.
  b. Color chiefly pale fawn with relatively little dusky mixture.
    c. Habitat south of lat. 20° north---------- *P. l. affinis*
    cc. Habitat north of lat. 20° north.
      d. Size larger; molars heavier; maxillary toothrow about 4. Chiefly northwestern.
        1. Color paler---------- *P. l. tornillo*
        2. Color slightly darker---------- *P. l. arizonæ*

dd. Size smaller; molars weaker; maxillary toothrow less than 4. Chiefly northeastern .... *P. l. texanus*

bb. Color chiefly dusky or rich dark fawn largely mixed with dusky.

c. Color slightly paler; adolescents not very blackish above. Peninsula of Yucatan and adjacent islands.

1. Size larger; skull and teeth heavier. Cozumel Island .... *P. l. cozumelæ*
2. Size smaller. Mainland of Peninsula of Yucatan .... *P. l. castaneus*

cc. Color slightly darker; adolescents with blackish dorsum. Veracruz and Puebla .... *P. l. mesomelas*

PEROMYSCUS LEUCOPUS (RAFINESQUE).

(Pl. VI, fig. 4.)

Musculus[a] *leucopus* Rafinesque, Am. Monthly Mag., III, p. 446, October, 1818.

Mus leucopus Desmarest, Mammalogie, II, p. 307, 1822.

Hesperomys leucopus Le Conte, Proc. Acad. Nat. Sci. Phila., p. 413, 1852.

Hesperomys (*Vesperimus*) *leucopus* Coues, Proc. Acad. Nat. Sci. Phila., p. 178, 1874.

Vesperimus americanus Allen, Bull. Am. Mus. Nat. Hist., N. Y., III, p. 297, June 30, 1891 (part).

Peromyscus leucopus Thomas, Ann. & Mag. Nat. Hist., ser. 6, XV, p. 192, footnote, February, 1895.

Type locality.—Western Kentucky; assumed to be near the mouth of the Ohio River.

Geographic distribution.—Western Kentucky south to southern Louisiana, west to Indian Territory, and east around the southern end of the Allegheny Mountains to eastern Virginia. Lower Austral zone.

Characters.—Size medium (hind foot about 20); tail usually shorter than head and body (rarely exceeding 80); tail evenly clothed with short hairs, decidedly less hairy than in *P. m. gracilis;* proximal two-fifths of hind foot hairy; ears medium (about 14 from notch) and thinly haired.

Color.—No. 132230, Mer Rouge, La., February 12, in new pelage: General color of upperparts Mars brown rather coarsely mixed with dusky; middle of back only slightly darker than remainder of upperparts; ears dusky, very narrowly margined with whitish, no white spots at bases; face like sides, no definite orbital ring, whiskers blackish above, white below; tail dusky brownish above, white below; hands and feet white, upper side of forearm dusky, 'ankles' brownish; underparts white somewhat modified by a slaty undercolor. No. 70984, Avery, La., March 10, pelage beginning to wear: Ground color of upperparts much as in No. 132230 but slightly more reddish; dusky mixture stronger and dark dorsal area more definitely different from sides. No. 71607, Hickman, Ky., April 26, pelage much worn: Sides and head rather dark cinnamon rufous without mixture of dusky, but with occasional brownish hairs; middle of back darker, nearly russet, brownish hairs more numerous. Adolescent, No. 33978,

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[a] The generic name *Musculus* was at one time mentioned by Coues (Monogr. N. Am. Rodentia, p. 46, 1877) as having claims for recognition instead of *Hesperomys*, then in use. It antedates *Peromyscus*, but since it is merely an emended form of *Mus* and was definitely stated to be such by Rafinesque, it has no standing.

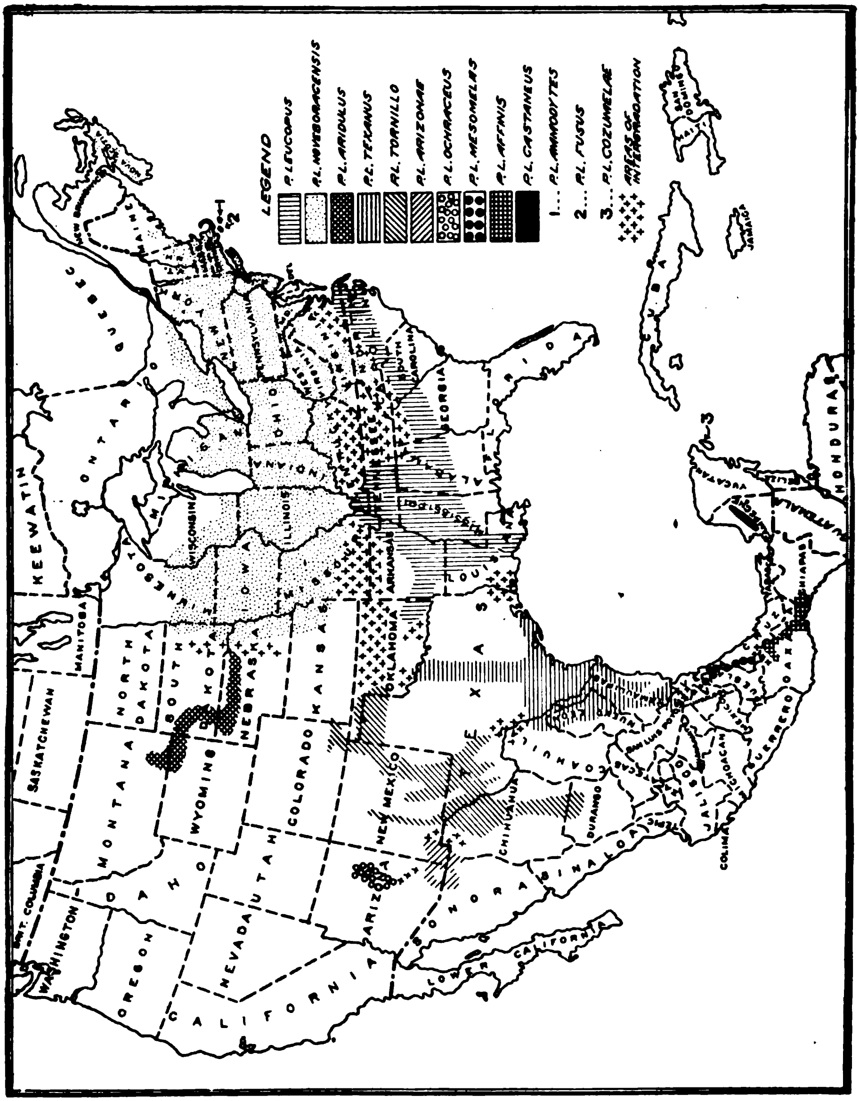

Fig. 2.—Distribution of *Peromyscus leucopus* and subspecies.

Houma, La., May 14: Upperparts Prout brown heavily mixed with dusky.

Skull.—Averaging slightly smaller than in *P. l. noveboracensis;* decidedly smaller than in *P. gossypinus;* molar teeth and audital bullæ smaller; zygoma less deeply notched by infraorbital foramen;

palatine slits usually narrower at either end than in the middle, thus together being elongate fusiform in shape; palatine slits usually ending well in advance of the plane of the front of first upper molar; premaxillæ somewhat swollen laterally in front of infraorbital foramina; interparietal moderate, about three times as long transversely as longitudinally.

Measurements.—Two specimens from Big Sandy, Tennessee: Total length, 180, 175; tail vertebræ, 78, 73; hind foot, 22, 20; ratio of tail vertebræ to total length, 0.433, 0.417. Average of 6 adults from Houma, La.: 166.5 (158–177); 77 (73–80); 20.5 (20–21); ear from notch (dry) 13.7 (13.4–14). One adult from Hickman, Ky.: 168; 73; 19.

Type specimen.—Not known to be in existence.

Remarks.—The species *Peromyscus leucopus*, considered as a group, is naturally divisible into three subspecies in the northeast and several others (*texanus*, etc.) in the southwest. The three forms of the northeast are well characterized at the extreme points of their range, which may be said to represent the apices of a triangle. They range without interruption from one to the other with complete intergradation. If these forms could be redescribed and new types designated, we should take the type of one from central New England, another from eastern Montana, and the third from southern Louisiana. The actual type locality of *leucopus*, however, is between the extremes, and the name must be used for one of two forms neither of which is well developed at this locality. With a rather meager representation of specimens from the type region of *leucopus*, it has seemed best to apply the name to the dark southern form, which is well developed in southern Louisiana and ranges north to western Tennessee and Kentucky, where it begins to show tendencies toward *P. l. noveboracensis*. Rafinesque does not give an exact locality in proposing the name *leucopus*, but in prefacing a number of descriptions, including that of *Musculus leucopus*, says:

> I have visited since the lower parts of the Ohio, the Wabash, Green River, Barrens, Prairies, and the States of Indiana, Illinois, etc., where I have added much to my former discoveries.

One of the species (?) (*Gerbillus megalops*) named on the same page with *Musculus leucopus*, is said to be found "in the barrens of Kentucky." No other mention of locality is made. Recent authors have in several instances considered the 'pine barrens of Kentucky' as the type locality. Since, however, the original locality mentioned was inclusive, it seems permissible to select a definite locality from among those known to have been visited by Rafinesque on the trip mentioned above. Apparently the most southern locality visited by him was the mouth of the Ohio River, and as it is desirable to apply the name *leucopus* to the southern form of the group, this may be considered the type locality. The only specimens I have seen from this region are those of a small series from Hickman, Ky. These, while evidently somewhat intermediate, are nearer to the dark southern form, and therefore the name *leucopus* is applied to this form rather than to the northern one, for which the name *noveboracensis* is available.

The long use of the name *leucopus* warrants its retention, even if it be necessary to construe its author liberally. The applicability of Rafinesque's description, however, is scarcely to be doubted, although he describes absolutely 'impossible' species (?) on the same page. The entire description is as follows:

> 7. *Musculus leucopus* R. (White feet mouse.) Body brownish, fallow above, white beneath, head fallow, ears large, blackish, tail as long as the body, pale brown above, gray beneath, legs and feet white. Length 5 inches.

The difference between *leucopus* and *noveboracensis* is not sufficiently marked so that individual specimens can be invariably identified. Still, specimens in absolutely comparable pelages are usually noticeably different. The character of *leucopus* consists in a sort of saturate or intensified color. As usual in such cases, there is a tendency toward the extension of the dark body color to parts which are white in paler forms. Thus, a tawny pectoral spot is found frequently in *leucopus*, but rarely or never occurs in *noveboracensis.* The color of the upperparts extends also to the upper side of the forearm in *leucopus*, and to a less degree or not at all in *noveboracensis.* The pelage of *leucopus* is shorter and possibly harsher than that of its northern representative. The winter pelage is not so long and full, and the period is shorter during which it does not show marked effects of abrasion. *P. leucopus* intergrades with *noveboracensis* on the north and probably with *texanus* on the west. Specimens from intermediate points have been referred, sometimes rather arbitrarily, to the form they appear to resemble most. A series from the Dismal Swamp, Virginia, is thus placed with *leucopus*, although it shows decided tendencies toward *noveboracensis.* Specimens from the border region between the Upper and Lower Austral zones are more or less intermediate. The only species of *Peromyscus* found within the range of *leucopus* which is at all likely to be confused with it is *P. gossypinus*, which may be distinguished chiefly by its larger size and usually by its more dusky coloration. The skull of *leucopus* is smaller and less massive than that of *gossypinus*, and the molar teeth are decidedly smaller.

Specimens examined.—Total number 309, from localities as follows:

Alabama: Greensboro, 8.
Georgia: Chickamauga Park, 2 (doubtfully referred).
Kentucky: Hickman, 8; Mammoth Cave, 2 (not typical).
Louisiana: Avery, 1; Houma, 17; Lafayette, 2; Mer Rouge, 4; Tallulah, 5.
Mississippi: Washington, 2.

North Carolina: Apex, 6; Chapanoke, 14; Currituck, 14; Raleigh, 52; Raleigh County, 8; Old Richmond, 1; Roanoke Rapids, 5; Rural Hall, 2.

Oklahoma: Fort Gibson, 1; Hartshorn, 2; Orlando, 1; Red Oak, 6.

South Carolina: Calhoun Falls, 4; Catawba, 3.

Tennessee: Arlington, 3; Big Sandy, 10; Briceville, 1; Clarksville, 4; Danville, 1; Dunbar Cave, 1; Nashville, 5; Samburg, 5; Watauga Valley, 5.

Virginia: Cappahosic, 4; Dismal Swamp, chiefly from Lake Drummond, 79; Hampton, 9; Newport, 3; Suffolk, 4; Tazewell, 5.

PEROMYSCUS LEUCOPUS NOVEBORACENSIS (FISCHER.)

(Pl. V, fig. 9; Pl. VI, figs. 8–8a; Pl. VII, fig. 3; Pl. VIII, figs. 2, 2A, 2B, 2C.)

Mus agrarius americanus Kerr, Anim. Kingd., p. 231, 1792; not *Mus americanus* Kerr, *l. c.*, p. 227.

Mus sylvaticus δ noveboracensis Fischer, Synopsis Mamm., p. 318, 1829.

Cricetus myoides Gapper, Zool. Journ., V, p. 204, Pl. X, 1830—Between York and Lake Simcoe, Ontario.

Arvicola emmonsi DeKay in Emmons, Rept. Quad. Mass., p. 61, 1840—Massachusetts.

Peromyscus arboreus Gloger, Hand u. Hilfsbuch Naturgesch., I, p. 95, 1841.

Mus michiganensis Audubon and Bachman, Journ. Acad. Nat. Sci., Phila., pp. 304–306, 1842—Erie Co., Mich. (=Ohio).

Hesperomys campestris Le Conte, Proc. Acad. Nat. Sci. Phila., VI (1852–53), p. 413, 1853—New Jersey.

Vesperimus americanus Allen, Bull. Am. Mus. Nat. Hist., N. Y., III, p. 297, June 30, 1891 (part).

Sitomys americanus Miller, Proc. Biol. Soc. Wash., VIII, p. 55, June 20, 1893.

Peromyscus leucopus noveboracensis Miller, Proc. Boston Soc. Nat. Hist., XXVIII, p. 22, April 30, 1897.

Peromyscus leucopus minnesotæ Mearns, Proc. Biol. Soc. Wash., XIV, pp. 154–155, August 9, 1901—Fort Snelling, Minn.

Type locality.—New York.

Characters.—Similar to *P. leucopus*, but averaging paler and slightly larger; pelage longer and softer; tail more thickly clothed with hair.

Geographic distribution.—Upper Austral and Transition zones of the eastern United States and Canada. Extending from Nova Scotia to central Minnesota, thence south through the humid parts of eastern Nebraska and Kansas and eastward to the Atlantic coast, following quite closely the boundary between the Lower and Upper Austral zones on the south and that between the Transition and Canadian on the north.

Color.—Similar to that of *P. leucopus*, but lighter and brighter; underparts usually pure white, entirely concealing undercolor; tail less distinctly bicolor. No. 69902, ♀ adult, November 25, Ossipee, N. H., new winter pelage: Upperparts cinnamon rufous, lightly mixed with dusky lines on sides, more heavily on middle of back; underparts creamy white; hands, feet, and forearms white; 'ankles' slightly brownish; ears dusky brownish with pale whitish edges; tail white below, dusky above. No. 126310, ♂ adult, April, Newburgh, N. Y., pelage slightly worn: Similar to No. 69902, but sides brighter, less mixed with dusky; dark dorsal area more contrasted with sides. No. 98776, ♂ adult, June 10, Eliot, Me., pelage much worn: General color of upperparts bright tawny, shading to dark cinnamon rufous in middle of back; sides nearly pure tawny with very few dusky tipped hairs and few brownish tipped ones. No. 76386, adolescent ♀, Ossipee, N. H., Dec. 30: Sides, face, etc., fawn color lightly mixed with dusky; middle of back decidedly darker.

Skull.—Practically as in *P. leucopus;* averaging very slightly larger.

Measurements.—Average of 10 adults from Montauk Point, New York: Total length, 173.4 (163–188); tail vertebræ, 77.5 (73–83); hind foot, 21.4 (21–22); ratio of tail vertebræ to total length, 43.5; ear from notch (dry) 14.3 (13.6–14.7). Of 10 adults from Ossipee, N. H.: 166.4 (159–182); 79 (75–88); 21 (20–22). Of 10 adults from Fort Snelling, Minn.: 181.7 (175–187); 77.5 (72–80); 21.4 (20.5–22).

Type specimen.—Not known to be extant.

Remarks.—By restricting the name *leucopus* to the Lower Austral form, the subspecies of the northern and eastern United States which has usually been known as *leucopus*, will be called *noveboracensis*. It is perhaps the best known of the white-footed mice, as it ranges over the most thickly populated part of the United States. Within its range at least two other species are found—*P. gracilis*, which is longer tailed and duller colored, and *P. bairdi*, which is decidedly smaller and usually more dusky in color. The name 'deer mouse' seems to have been given it because of its supposed seasonal change of color, corresponding to that of the Virginia deer. Adult mice, however, do not show such marked seasonal difference in color as the deer. The gray and the 'red' coats of the deer are those of winter and summer, but those of the mice are of the adolescent and the fully mature, regardless of season. The pelage of the adult is almost continually changing, although it appears to be entirely renewed only once a year. The entire new pelage is acquired in late summer or fall, varying from June to November, usually but not always earlier in southern latitudes and later in northern. At first the new coat is rather short, particularly if the change has occurred in midsummer, and the color very uniform, with little or no contrast between sides and back. This coat gradually fills out and black or dusky hairs become more numerous in the mid-dorsal region, until it is somewhat darker than the sides. The dusky, however, is still somewhat mixed with tawny; and the amount of dusky varies in different individuals. This condition remains practically unchanged for the greater part of the winter. In spring (March to May) the pelage becomes roughened by abrasion and the contrast between back and sides is heightened. The sides become brighter, more tawny, and the tips of the hairs in the middle of the back wear off, exposing more or less of the basal color, which is deep blackish slate. As abrasion continues the tawny hairs become deeper colored, and the dusky fades to cinnamon or tawny, and when the pelage is quite short new hairs begin to come in on the anterior parts. The pelage of the middle of the rump is the last to be renewed, and specimens may often be found in which the pelage is entirely new except a small patch of tawny or cinnamon rufous on the rump. In a general way it may be said that the new fall and winter conditions of pelage are paler and more yellowish, while the partially abraded conditions of spring and summer are brighter and more reddish.

The name *americanus* is the earliest one for this species, but being preoccupied can not be used. *Cricetus myoides* also undoubtedly refers to this mouse. *Arvicola emmonsi* and *Hesperomys campestris*[a] are from localities inhabited only by this species, so there is no question of the propriety of placing them in the list of synonyms. The reference of *Mus michiganensis* to this form has been discussed under *P. m. bairdi* (see p. 81). *P. l. minnesotæ* does not seem to be sufficiently characterized to be recognized. It shows some slight average tendency toward *P. l. aridulus*, but is much nearer to typical *noveboracensis*. A very large series from the type region of *minnesotæ* contains a few specimens that are rather larger than the average *noveboracensis* and slightly paler; the rest are indistinguishable from typical *noveboracensis*. This seems to indicate a slight tendency toward *P. l. aridulus*, but since *minnesotæ* is so much nearer *noveboracensis*, and since there is not room for three forms, it seems best to treat *minnesotæ* as a synonym of *noveboracensis*. Specimens from Kansas, Nebraska, Iowa, etc., are not typical, tending toward either *leucopus* or *aridulus* or both. A few specimens from Nova Scotia have rather long tails, but the material is too scanty to warrant their separation.

Specimens examined.—Total number 2,084, from localities as follows:

Arkansas: Fayetteville, 1; Hardy, 4 (aberrant).

Connecticut: East Hartford, 24; Liberty Hill, 12.

District of Columbia: Vicinity of Washington, 155.[b]

Illinois: Fox Lake, 1; Henderson County, 30; Parkersburg, 8; Warsaw, 3; West Northfield, 3.

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[a] The type of *H. campestris* is preserved in the U. S. National Museum (No. 4726), but is in such poor condition as to be little more than generically determinable. It has no skull, and the distorted skin appears to have been preserved originally in alcohol.

[b] Including some localities in Virginia and Maryland.

Indiana: Bascom, 4; Du Bois County, 1; Denver, 6; Hebron, 4; Laporte, 5; Mitchell, 1; Mount Ayr, 2; New Harmony, 2 (position doubtful).

Iowa: Burlington, 57; Council Bluffs, 5; Knoxville, 10; Redfield, 1.

Kansas: Fort Leavenworth, 6; Fort Riley, 2; Lawrence, 24; Manhattan, 5; Neosho Falls, 2; Onaga, 7.

Kentucky: Eubank, 19; Lexington, 13 (aberrant).

Maine: Eliot, 3; Oakland, 1; Small Point, 2.

Maryland: Grantsville, 3; Hyattsville, 2; Laurel, 9; Plummer Island, 2; Rawlings, 2; Rockville, 1; Swanton, 3.

Massachusetts: Barnstable Neck, 17;[a] Bedford, 11; Belmont, 2; Concord, 1; Lexington, 6; Malden, 2; Middleboro, 14; Monomoy Island, 81; Muskeget Island, 17; Nantucket Island, 13; Seehonk, 4; Sheffield, 4; South Hanson, 4; Wareham, 64; West Dedham, 5; Wilmington, 27.

Michigan: Ann Arbor, 10; Au Sable River, Oscoda County, 2;[b] Grayling, 1;[b] Manchester, 2; Spring Lake, 1.[b]

Minnesota: Elk River, 21; Farmington, 1; Fort Snelling, 88; Hinckley, 1; Minneapolis, 9.

Missouri: Bismarck, 3; Hunter, 10; Kimswick, 1; Marble Cave, 2; Piedmont, 1; Stotesbury, 16; Williamsville, 2.

Nebraska: Havelock, 1;[c] London, 1; Neligh, 1; South Auburn, 4; Verdigris, 2.

New Hampshire: Antrim, 5; Ossipee, 31; Summit, Mount Washington, 2 (introduced?); Webster, 11.

New Jersey: Alpine, Bergen County, 11; Bridgeton, 22; Cape May, 1; Chairville Bog, Burlington County, 1; Collingwood, Camden County, 12; Culver Lake, Sussex County, 24; Delaware Gap, 6; Fairview, 8; Fort Lee, 1; Granton, 10; Greenwood Lake, 28; Hackensack Marsh, 1; Haddonfield, 48; Lake Hopatcong, 3; Long Lake, Sussex County, 11; Mauricetown, 1; Mays Landing, 20; Nordhoff, 10; Pleasant Valley, 7; Port Norris, 3; Sandy Hook, 5; Sea Girt, 3; Tuckahoe, 23; Tuckerton, 42; Walkill Bottoms, Sussex County, 9.

New York: Catskill Mountains, 21; Cornwall, 2; Croton Falls, 1; Elizabethtown, 7; Garrison, 1; Hastings, 40; Highland, 2; Highland Falls, 23; Jamaica, Long Island, 8; Kiskatom, 6; Lake George, 38; Lake Grove, Long Island, 3; Lawyersville, 8; Locust Grove, 5; Miller Place, Long Island, 8; Montauk Point, 27; Newburgh, 2; New Rochelle, 1; Nyack, 40; Ossining, 2; Owego, 5; Peterboro, 8; Plum Island, 1; Schernerus, 1; Shelter Island, 2; Stamford, 8; Syracuse, 3.

North Carolina: Magnetic City, 1; Weaverville, 42.

Nova Scotia: Digby, 3; Newport, 3.

Ohio: Garrettsville, 5; Hicksville, 9; Madisonville, 1; Ravenna, 6; Sandusky, 2.

Ontario: Credit, 8; Lorne Park, 20; Toronto, 2; Woodham, 1.

Pennsylvania: Aldan, Delaware County, 1; Barren Ridge, 2; Bushkill Creek, Monroe County, 9; Clifton, Delaware County, 1; Cooks Mills, 32; Drury Run, 6; Erie, 2; Germantown, 7; Hopewell, Bedford County, 8; Jenkintown, 1; Keating, Clinton County, 4; Kings, Cambria County, 13; Lehigh Gap, 4; Manoa, 7; Marple, 4; Markleton, 1; Mount Union, 18; North Mountain, 1; Philadelphia (Pennypack Creek), 1; Porter Lake, Pike County, 6; Renovo, 3; Round Island, 10; Thorndale, 5; Tinicum, Delaware County, 16; Tuscarora, Juniata County, 2; Tyrone, 14; Valley Forge, 2; Waynesburg, 3; Westtown, 1; Wynnewood, 1.

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[a] Including some specimens approaching *ammodytes*.

[b] Collection of University of Michigan.

[c] Carnegie Museum.

Rhode Island: Block Island, 12; Chepachet, 10; Conanicut Island, 5; Fort Adams, 17; Lake Worden, 101; Middletown, 1; Newport, 6.

Vermont: Burlington, 2; Hartland, 12; Rutland, 4.

Virginia: Peaks of Otter, 1.

West Virginia: Franklin, 4; White Sulphur Springs, 67.

Wisconsin: Camp Douglas, 16; Delavan, 7; Milton, 2.

PEROMYSCUS LEUCOPUS AMMODYTES BANGS.

Peromyscus leucopus ammodytes Bangs, Proc. New Eng. Zool. Club, IV, pp. 14–15, Feb. 28, 1905.

Type locality.—Monomoy Island, off coast of Massachusetts.

Characters.—Upperparts decidedly paler than in *P. l. noveboracensis;* underparts pure white to roots of hairs; otherwise similar to *noveboracensis.*

Color.—December specimens: General color of sides pale fawn; middle of back darker, but somewhat mixed with fawn; median underparts pure creamy white to roots of hairs, this sometimes extending laterally almost to lower sides; hands and feet white; tail pale brownish fawn above, white below; ears pale brownish dusky thinly clothed with whitish hairs on the inside and on the marginal part of the outside.

Skull.—Practically as in *P. l. noveboracensis.*

Measurements.—Average of 10 adult topotypes: Total length 173 (161–190); tail vertebræ 79 (71–88); hind foot 20 (19.5–21); ratio of tail vertebræ to total length 45.6.

Type specimen.—In the Museum of Comparative Zoology, Cambridge, Mass. Formerly No. 828 Collection of E. A. and O. Bangs. ♂ adult. Dec. 28, 1893. O. Bangs and G. S. Miller, jr. Specimen nearly perfect.

Remarks.—Monomoy Island is a low, sandy island off the southeast coast of the Cape Cod Peninsula. It is periodically connected with the mainland by a long, narrow stretch of sand. Notwithstanding this, however, the island mice differ more markedly from those of the mainland than do those of any of the other islands in the vicinity, which are permanently cut off from the mainland. Typical *noveboracensis* also occurs on the island, and various intermediate stages between it and *ammodytes* are found. A slight tendency to albinism is noticeable in several specimens. Specimens with nearly white underparts are also found on the mainland at Barnstable Neck. Bangs (supra cit.), in writing of this very interesting mouse, says:

> While pale grayish specimens, with pure white bellies, greatly predominate on Monomoy Island, there is still a wide range of variation in color, and a few individuals caught with the others are not distinguishable in any way from

mainland specimens, and between these and the palest examples every degree of intermediate occurs. The reason for this, I think, is very simple. Monomoy, though often in the course of its history an island, has been at other times joined to the mainland by a long beach. At such times skunks, cottontail rabbits, and foxes have worked their way to the island, and have established themselves there for at least a time. The deer mouse from the mainland probably has come in the same way, and from time to time has infused into the island form the very characters it was struggling to eliminate.

Specimens examined.—Total number 25[a], all from the type locality.

PEROMYSCUS LEUCOPUS FUSUS Bangs.

Peromyscus leucopus fusus Bangs, Proc. New Eng. Zool. Club, IV, p. 13, Feb. 28, 1905.

Type locality.—West Tisbury, island of Marthas Vineyard, off south coast of Massachusetts.

Geographic distribution.—Island of Marthas Vineyard, Massachusetts.

Characters.—Similar in general to *P. l. noveboracensis*, but somewhat larger; skull with slightly elongated rostrum.

Color.—As in *P. l. noveboracensis.*

Skull.—Larger and heavier than in *noveboracensis;* nasal and rostral region somewhat more elongated; audital bullæ relatively rather small.

Measurements.—Average of 6 adult topotypes: Total length, 194.4 (190–203); tail vertebræ, 90.7 (85–96); hind foot, 22.4 (21.5–23.5); ratio of tail vertebræ to total length, 46.6.

Type specimen.—No. 9737 Museum of Comparative Zoology, Cambridge, Mass.; formerly same number, collection of E. A. and O. Bangs. ♂ adult. June 17, 1899. O. Bangs. Specimen practically perfect.

Remarks.—The mice from Muskeget, Nantucket, Block Island, and other small islands off the southern coast of New England are somewhat more robust than typical *noveboracensis*, but none of them seem sufficiently characterized for recognition except those from Marthas Vineyard. These, however, are so decidedly larger than *noveboracensis* and their skulls so easily distinguishable by size and other slight peculiarities that they are well deserving of separation.

Specimens examined.—Total number 13, all from the type locality.

PEROMYSCUS LEUCOPUS ARIDULUS subsp. nov.

Type from Fort Custer, Mont. No. 75704 U. S. National Museum, Biological Survey Collection. Adult ♀. Nov. 12, 1895. J. A. Loring.

Geographic distribution.—Upper Sonoran zone of eastern Montana and Wyoming and the adjoining western parts of South Dakota and Nebraska; probably south to Oklahoma and west to eastern Colorado.

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[a] Of these, 13 are quite typical and 12 are evidently intermediate.

Characters.—Similar to *P. l. noveboracensis*, but larger and paler; somewhat similar to *P. m. nebrascensis*, but larger, with a longer tail; skull with wider braincase, larger audital bullæ, and larger molar teeth.

Color.—Similar to that of *P. l. noveboracensis*, but decidedly paler; dark dorsal area much reduced; ears pale. Type: Upperparts ochraceous buff very lightly mixed with dusky; middle of back somewhat darker than sides, but not sharply contrasted; head and face nearly like sides; underparts creamy white.

Skull.—Similar to that of *P. l. noveboracensis*, but larger and heavier; braincase usually wider; somewhat similar to that of *P. m. nebrascensis*, but braincase larger and wider; nasals broader; rostrum more depressed; premaxillæ less swollen laterally; outer edges of palatine slits less nearly parallel; molar teeth larger; audital bullæ larger.

Measurements.—Type: Total length, 177; tail vertebræ, 73; hind foot, 22; ear from notch (dry), 14.5. Average of 4 topotypes: 169 (160–177); 69 (63–73); 22 (21–23); 14.1 (13.6–15.5). Average of 5 adults from Valentine, Nebr.: 184 (170–196); 86 (75–90); 22.2 (21–23). Adult female from Buffalo Gap, S. Dak.: 205; 93; 22.

Remarks.—The range of this form is probably more extensive than is indicated by the specimens now at hand. It is probable that it extends down through western Kansas and meets that of *P. l. texanus.* Although its range is in the arid subdivision of the Upper Austral zone, it appears that it lives chiefly in the relatively humid parts of this region, that is, along the watercourses and in the slightly wooded places. The more open and relatively more arid parts of the region are inhabited by *P. m. nebrascensis*, which is often very nearly the same color as *P. l. aridulus. P. m. nebrascensis* is specifically distinct, however, and may be distinguished from *aridulus* not only by a combination of cranial characters, but also by its smaller size and shorter tail, and by the presence, in most cases, of definite white spots in front of the ears.

Specimens from eastern Nebraska and Kansas are apparently intermediate between *noveboracensis* and *aridulus*, having the darker color of *noveboracensis* and the larger size of *aridulus.*

The reference of specimens from Oklahoma to this form is rather unsatisfactory. There seems to be no other disposition of them, however, so far as can be judged by present material. The localities from which these specimens came are chiefly near the boundary between the humid and arid regions, and they are also near the line between the Upper and Lower Sonoran zones. If we suppose that *leucopus*, *texanus*, etc., have continuous distribution with gradual intergradation (and no doubt this is the case), we should expect to find specimens in central Oklahoma intermediate in character between *aridulus* and *texanus* on the one hand and between *leucopus* and *texanus* on the other. Actual specimens meet all the requirements of the hypothetical case, not being exactly like any of the three species mentioned when compared with specimens from the respective type localities. They are more ochraceous than *texanus*, paler than *leucopus*, and slightly darker and more vinaceous than *aridulus*, and still not the same as *noveboracensis*, although some are quite similar to intermediates between *aridulus* and *noveboracensis* from eastern Kansas and Nebraska. If not referred to *aridulus*, they should be placed with *texanus*.

Specimens examined.—Total number 148, from localities as follows:

Minnesota: Browns Valley, 2 (approaching *noveboracensis*).
Montana: Crow Agency, 2; Custer Station, 2; Fort Custer, 11; Little Bighorn River, 1.
Nebraska: Cody (10 miles south), 4; Valentine, 9; head of Warbonnet Creek, 1.[a]
South Dakota: Buffalo Gap, 1; Custer, 1; Spring Creek, 9; Squaw Creek, 6.
Oklahoma: Alva, 11; Apache, 1; Chattanooga, 3; Kiowa Agency (11 miles southeast of Fort Cobb), 1; Lawton, 1; 17 miles southeast of Fort Cobb, 1; Noble, 21; White Horse Spring, 16; Wichita Mountains (chiefly in vicinity of Mount Scott), 44.

PEROMYSCUS LEUCOPUS OCHRACEUS subsp. nov.

Type from Winslow, Ariz. No. 53301 U. S. National Museum, Biological Survey Collection. ♂ adult. Apr. 30, 1893. C. P. Streator.

Characters.—Similar to *P. l. tornillo* and *P. l. arizonæ*, but color ochraceous buff instead of fawn; no obvious dorsal stripe.

Color.—Ground color of upperparts bright ochraceous buff without suggestion of fawn; entire upperparts lightly lined with dusky, slightly more thickly on middle of back than on sides, but not forming a definite dorsal stripe; ears edged with creamy white; no white spots at base of ears; underparts white tinged with ochraceous buff; tail dusky brownish above, buffy white below; feet and hands buffy white; wrists marked with ochraceous buff.

Skull.—Practically as in *P. l. tornillo;* infraorbital part of zygoma very heavy.

Measurements.—Type and one topotype: Total length, 180, 173; tail vertebræ, 82, 82; hind foot, 22.5, 22.5.

Remarks.—This form is most closely similar in color to *P. l. aridulus*, differing in being slightly more ochraceous and in almost totally lacking any dark dorsal stripe. Its color is very much the same as that of highly colored examples of *P. m. nebrascensis*, from which it is distinguished by the numerous external and cranial characters of the *leucopus* group. Its real relationship is probably with *tornillo* and *arizonæ* rather than *aridulus*. Specimens from Fort Verde, Ariz., are variable, some closely resembling *arizonæ* and others being deep ochraceous, somewhat darker than the type of *ochraceus*.

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[a] Carnegie Museum.

Specimens examined.—Total number 9, from localities as follows:

Arizona: Baker Butte, Mogollon Mountains, 1; Fort Verde, 6; Winslow, 2.

PEROMYSCUS LEUCOPUS TORNILLO (MEARNS).

(Pl. III, fig. 1.)

Peromyscus tornillo Mearns, Proc. U. S. Nat. Mus. XVIII, pp. 445–446, Mar. 25, 1896.

Peromyscus texanus flaccidus Allen, Bull. Am. Mus. Nat. Hist., N. Y., XIX, pp. 599–600, Nov. 14, 1903—Rio Sestin, Durango, Mexico.

Type locality.—Rio Grande, 6 miles above El Paso, Tex.

Geographic distribution.—Upper Sonoran zone and part of the Lower Sonoran of western Texas and eastern New Mexico; north to southeastern Colorado and south to northern Durango; northeast to western Oklahoma.

Characters.—Size, proportions, and cranial characters about as in *P. l. aridulus;* color very much paler, more fawn; back only slightly or not at all darker than sides; no white at base of ear. Similar to *P. l. arizonæ* but averaging paler. Similar to *P. l. texanus* but averaging larger and slightly paler; skull larger and more angular; molar teeth heavier.

Color.—No. 58379, ♀ adult, February 3, El Paso, Tex., in full winter pelage: Ground color of upperparts fawn color uniformly mixed with fine dusky lines; head and face about like back and sides; no white spot at base of ear; underparts pure creamy white; hands, feet, and arms white; 'ankles' white, except a faint brownish spot on outer side; ears dusky, rather broadly edged with whitish; tail indistinctly bicolor, pale brownish above, white below. Worn pelage: Brighter and more rufescent than winter pelage; general color ranging from pale fawn to vinaceous cinnamon.

Skull.—Practically the same as that of *P. l. aridulus;* averaging larger and more angular than in *P. leucopus* or *P. l. texanus;* molar teeth broader and heavier than in *texanus*. Compared with that of *P. m. blandus* the skull of *tornillo* is larger; braincase relatively wider and lower; nasals narrower, more convex, and more compressed posteriorly; premaxillæ more swollen laterally; palatine slits relatively shorter and with more lateral convexity; mandibles relatively shorter and thicker; lateral protuberance at base of lower incisor more prominent; angle below mandibular condyle shallower and more obtuse.

Measurements.—Average of 10 adults from the vicinity of El Paso, Tex.: Total length, 182 (171–202); tail vertebræ, 82.6 (75–97); hind foot, 22.5 (21–24); ratio of length of tail vertebræ to total length, 45.4; ear from notch (dry), 14.5 (13.9–15.3).

Type specimen.—No. $\frac{20036}{35450}$ U. S. National Museum. Adult ♂. Feb. 18, 1893. E. A. Mearns and F. X. Holzner. Specimen in good condition.

Remarks.—This subspecies occupies a considerable range in western Texas, northeastern Mexico, and nearly all of New Mexico, maintaining its characters with great constancy throughout. It intergrades on the west with *P. l. arizonæ* and on the southeast with *P. l. texanus.* Its relationship to *leucopus* is shown by specimens from central Oklahoma, which are evidently intermediate in color, and which have been referred tentatively to *aridulus.* Specimens from the "Panhandle" of Texas and from northeastern New Mexico (Clayton), while distinctly referable to *tornillo*, may be considered slightly intermediate between *tornillo* and *aridulus;* two immature examples from Canyon City, Colo., also approach *aridulus.*

The only synonym is *P. flaccidus* from northwestern Durango described by Allen who did not consider its relationship to *tornillo*, but compared it only with *arizonæ*, mentioning the characters which distinguish *tornillo* and *arizonæ*.

Specimens examined.—Total number 219, from localities as follows:

Chihuahua: Casas Grandes, 7; Chihuahua, 13; near Fort Bliss, Tex., 1; Juarez, 15.

Colorado: Canyon City, 2; Gaume Ranch, Baca County, 1;[a] Lamar, 1;[a] Monon, 1.[a]

Durango: Rancho Santuario, 4; Rio Sestin, 29; Rio del Bocas, 3; Rosario, 4; San Gabriel, 4.

New Mexico: Cabra Spring, 1; Chamberino, 1; Clapham, 7; Clayton, 5; Corona, 1; Eddy, 1; Fort Sumner, 1; Jarilla, 1; Laguna, 1; La Mesa, 8; Manzano Mountains, 4; Mesa Jumanes, 2; Mesilla, 3; Organ Mountains, 6; Rio Puerco, 7; near Roswell, 1; San Andres Mountains, 3; Sandia Mountains, 5; Santa Fe, 1; Santa Rosa, 1; Tularosa, 10.

Texas: Altuda, 2; Canadian, 3; near El Paso, 22; Fort Hancock, 1; Franklin Mountains, 7; Lipscomb, 11; Miami, 3; Mobeetie, 2; Paisano, 1; Sierra Blanca, 10.

United States and Mexican Boundary: 100 m. west of El Paso, 2.

PEROMYSCUS LEUCOPUS ARIZONAE (ALLEN).

Sitomys americanus arizonæ Allen, Bull. Am. Mus. Nat. Hist., N. Y., VI, p. 321, November 7, 1894.

Peromyscus texanus arizonae Miller and Rehn, Proc. Boston Soc. Nat. Hist., XXX, p. 84, December, 1901.

Type locality.—Fairbank, Cochise County, Ariz.

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[a] Collection of E. R. Warren.

Geographic distribution.—Southeastern Arizona and adjacent parts of Mexico and New Mexico.

Characters.—Similar to *P. l. tornillo*, but averaging slightly darker.

Color.—As in *texanus*, but usually slightly darker and with a greater amount of dusky admixture.

Skull.—Practically as in *P. l. tornillo.*

Measurements.—Average of 5 adults from Santa Cruz, Sonora, Mexico: Total length, 186 (178–193); tail vertebræ, 82.6 (78–85); hind foot, 22.6 (22–24). Two adults from San Pedro River, Arizona: 202; 94; 23.5—189; 87; 22.3.

Type specimen.—No. $\frac{8416}{6743}$ American Museum of Natural History. Adolescent ♂. March 13, 1894. W. W. Price and B. C. Condit. Specimen in good condition.

Remarks.—Many specimens of *arizonæ* and *tornillo* are absolutely indistinguishable. Large series, however, appear somewhat different when viewed as a whole. Some specimens of *arizonæ* are darker than any of *tornillo*, and conversely some *tornillo* are paler than any *arizonæ*. Darker color, then, may fairly be called an 'average character' of *arizonae*. It may be distinguished from *sonoriensis*, with which it is often found, by its larger size, longer and less distinctly bicolor tail, by the absence of prominent white spots in front of the ears and by the same cranial characters which distinguish *tornillo* from *blandus*.

Specimens examined.—Total number 103, from localities as follows:

Arizona: Calabasas, 1; Fairbank, 31; Fort Lowell, 1; San Pedro River at Mexican boundary, 9; Tucson, 6; Turkey Tanks, 1.

New Mexico: Deming, 4; Gila, 6; Glenwood, 1; Redrock, 1.

Sonora: San Bernardino Ranch, 4; Santa Cruz, 26; Santa Cruz River, 8; Tubac, 3; Mission of Tumacacori, near Tubac, 1.

PEROMYSCUS LEUCOPUS TEXANUS (WOODHOUSE).

(Pl. III, fig. 12.)

Hesperomys texana Woodhouse, Proc. Acad. Nat. Sci. Phila., VI (1852-3), p. 242, 1853.

Vesperimus mearnsii Allen, Bull. Am. Mus. Nat. Hist., N. Y., III, pp. 300–302, June, 1891.—Brownsville, Tex.

Peromyscus canus Mearns, Proc. U. S. Nat. Mus., XVIII, p. 445, March 25, 1896. Fort Clark, Tex.

Peromyscus texanus Mearns, Bull. U. S. Nat. Mus. No. 56, pp. 404–406, 1907.

Type locality.—Originally stated (probably erroneously) as the "Rio Grande, near El Paso," Texas. Assumed to be the vicinity of Mason, Mason County, Tex. (See Remarks p. 129).

Geographic distribution.—Southern Texas and eastern Mexico, chiefly in the States of Tamaulipas and Nuevo Leon; extending west to the vicinity of the mouth of the Pecos River, north to about latitude 33° north, east to west side of Galveston Bay, and south to State of San Luis Potosi. Lower Sonoran zone.

Characters.—Similar to *P. l. tornillo*, but slightly smaller and darker; pelage usually shorter and more subject to abrasion; tail more scantily haired; skull smaller; molar teeth smaller.

Color.—No. 58580 from Brownsville, Tex. ♂ adult. Feb. 19. unworn pelage: Similar in general to *P. l. tornillo*, but ground color slightly deeper darker fawn, and mixture of dusky more copious; ears darker; tail slightly darker above. No. 30856, August 31, worn pelage: Upperparts pale fawn lightly mixed with cinnamon brown.

Skull.—Similar to that of *P. l. tornillo*, but averaging decidedly smaller; molar teeth particularly small and narrow.

Measurements.—Average of 10 adults from Brownsville, Tex.: Total length, 180 (170-190); tail vertebræ, 84.8 (81-95); hind foot, 20; ear from notch (dry), 14.8 (14.1-15.6). Average of 10 adults from Fort Clark, Tex.: Total length, 178 (160-195); tail vertebræ, 77 (68-91); hind foot, 21.5 (20.5-22.8).

Type specimen.—No type was designated by the original describer, but two of his specimens, supposed to have been the basis of the name, are still in the U. S. National Museum, No. $\frac{37026}{2559}$, a skin in alcohol, and No. $\frac{37155}{4748}$, a dry skin. The first of these was examined by Baird and enumerated in his list of specimens (Mamm. N. Am., p. 464, 1857). Later, Coues gives *Hesperomys texana* in synonymy under *H. leucopus* (Mon. N. Am. Rodentia, p. 51, 1877), and in parenthesis after the reference says: "(El Paso, Tex.; type, No. 2559, Mus. Smiths.)" The same specimen was again mentioned by Mearns (Proc. U. S. Nat. Mus., XVIII, p. 446, footnote, Mar., 1896), who says: "Two of Doctor Woodhouse's specimens are still in the U. S. National Museum. One of these, the type, is alcoholic, and the other a skin." These references doubtless account for the fact that No. $\frac{37026}{2559}$, the alcoholic, now bears a red type label, while the other existing specimen, No. $\frac{37155}{4748}$, does not. Besides the recent red type label, this specimen bears four others—a metal tag with the number 2559; a paper label, possibly the original collector's, with only the faintest indication of writing; another with the printed legend: "Monograph of American Muridae. Dr. Elliot Coues, U. S. A.," and under it "Type of," followed by the written words "*Hesp. texanus* Woodh. West. Texas. S. W. Woodhouse." On the back of this label we find "=*leucopus*." Still another label, comparatively fresh and in an unknown hand, repeats the ordinary data and gives a new name, from which it is to be inferred that someone considered naming the specimen in honor of Doctor Woodhouse. This specimen then is practically the type, although it might be argued that No. $\frac{37155}{4748}$ is a cotype of equal importance. Fortunately, the two specimens appear to be conspecific, and the choice between them is of no importance. The skin of No. $\frac{37026}{3559}$ is evidently so much shrunken that none of its dimensions can be relied upon. Its original color also has been altered beyond recognition. At present it is dark cinnamon above and dark dirty clay color below. The skull consists of seven separate fragments. The largest of these contains the nasals, part of the premaxillæ, and both upper incisors. Both mandibles are present, and only slightly broken, all the teeth being intact. Three small bits of the maxillaries hold five of the upper molars. The braincase, bullæ, palate, etc., are entirely absent. The skin of No. $\frac{37166}{4748}$ has been taken from alcohol and remodeled and dried. In color it is slightly lighter below and more reddish brown above than the other specimen, but it plainly shows the effect of a long immersion in alcohol. Its skull is slightly more complete, although very much shattered. The mandibles are perfect, and both upper and lower teeth are all present. It comprises 19 distinct fragments.

Remarks.—Waterhouse, in the original description of *Hesperomys texana*, says, "Habitat.—Western Texas," and in the same signature, under "Observations":

> I procured this little animal on the Rio Grande near El Paso, while attached to the party under the command of Capt. L. Sitgreaves, U. S. Topographical Engineers, on our way to explore the Zuni and Colorado rivers.

In the introduction to his complete report,[a] he says:

> The party left San Antonio on the 7th of May passing over the road laid out under the direction of Bvt. Lieut. Col. J. E. Johnston, U. S. Topographical Engineers, in the year 1849, from San Antonio to El Paso, along which I made collections of considerable interest in the different departments of natural history.

The route laid out by Lieutenant-Colonel Johnston we find was as follows:[b]

> From San Antonio northwest to the San Saba River, via Fredericksburg, then westward to its source, from which he passed over to the Pecos at Live Oak Creek. He then proceeded to the Limpia River, and made his way to the Rio Grande by the road which strikes it about latitude 30° 38′, thence he traveled to El Paso.

This exact definition of the route is of considerable importance in determining Woodhouse's material.

Among several forms of *Peromyscus* found in western Texas are three having relatively short tails, two of them belonging with the *leucopus* series and the third an eastern relative of *sonoriensis*. By the original description alone it would be extremely difficult to determine to which the name was applied, but fortunately the existence of specimens supposed to be cotypes renders possible a fairly satisfactory conclusion. Although in a poor state of preservation, these specimens are identifiable by means of numerous slight but convincing cranial characters with the forms (*mearnsi* and *tornillo* of authors) related to *leucopus* rather than with the one belonging to the *maniculatus* group (*P. m. blandus*). The most important of these characters are found in the rostrum and the mandible. In No. $\frac{37026}{2559}$ the rostral part of the skull is fairly well preserved and extremely characteristic, having the narrow nasals and laterally swollen premaxillæ never found in *P. m. blandus*, but usually present in the forms represented by the names *mearnsi* and *tornillo;* the mandibles are relatively short and broad, unlike the slender ones of *blandus*, but exactly matching in proportions those of the two other forms. These characters alone are amply sufficient to eliminate *blandus* from the possibilities, and it therefore remains to decide to which of the other two the name shall be applied. The color and measurements of the cotypes are of almost no value on account of the immaturity of the specimens and the length of time they have remained in alcohol. Also, Woodhouse's original description and measurements were evidently taken from the alcoholics and not from the fresh specimens, so these offer little or no assistance, at least none in determining between two forms which have all general characters in common.

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[a] Sitgreave's Exped. Zuni and Colo. Rivers, p. 33, 1853.

[b] Pac. R. R. Reports, XI, p. 60, 1855.

One of the two forms under consideration (*tornillo*) occurs on the "Rio Grande near El Paso," while the other occurs south and east of the Pecos River. The chief distinguishing character is the size of the molar teeth, which are larger and broader in *tornillo*. The cotypes have small, narrow teeth, exactly like those of the southern form and decidedly different from those of the majority of specimens of *tornillo*. There is some variation in the size of the teeth in both forms, and it was at first thought that the cotypes were exceptionally small individuals of the northern form, but careful search and comparison among a considerable series from the "Rio Grande near El Paso" fails to reveal a single specimen of any age with teeth so small and narrow as those of the cotypes, while they may be matched with ease by specimens from any part of the range of the southern form. Therefore, there seems to be no alternative but to apply the name to the form with which the cotypes agree and consequently to assume that Woodhouse was mistaken as to the locality from which they came. Considering the known laxity in such matters on the early expeditions, it is not difficult to believe that a slight error in labeling was made. The view is somewhat strengthened by the fact that only a few days before he reached the "Rio Grande near El Paso" Woodhouse passed through country (San Antonio to San Saba River) in which we now find specimens matching his cotypes. For example, specimens from Mason, Tex. (practically Fort McKavett), agree with them and the locality is on the route, so if a new type locality is necessary, this may be chosen.

The average difference between *P. l. texanus* and *P. l. tornillo* is fairly marked, but certain individuals may be found that are indistinguishable. As a rule, however, the small size of the teeth in *texanus* serves to distinguish it. Specimens from the vicinity of the mouth of the Pecos River are intermediate between *texanus* and *tornillo*, but the majority are nearer *texanus*, having small teeth and averaging darker than *tornillo*. Among specimens of this class are those from Fort Clark which have been called '*canus*.' On the south intergradation with *P. l. mesomelas* is indicated by specimens from Rio Verde and Valles, San Luis Potosi, Mexico. These also, however, are nearer *texanus*. Certain specimens in full winter pelage are somewhat more grayish than others, possibly representing a slight color phase. In general the pelage differences are more marked than in *tornillo*, and summer specimens are usually very short-haired. The gap between the easternmost localities for *texanus* (vicinity of Galveston Bay) and the most southwestern localities for *leucopus* (southern Louisiana) is not very wide, and intermediate specimens are to be expected from this region. The material from the eastern part of the range is rather unsatisfactory, but the best adults are referable to *texanus*, although some tendencies toward *leucopus* are exhibited. Three specimens from north central Texas (Decatur, Benbrook, and Gainesville) are practically indistinguishable from typical *texanus*. Another from Henrietta in the same general region apparently is intermediate between *texanus* and *tornillo*.

Specimens examined.—Total number 572, from localities as follows:

Coahuila: Sabinas, 3.

Nuevo Leon: Cerro de la Silla, 4; 15 leagues south of China, 1; Lampazos, 2; Linares, 4; Montemorelos, 6; Monterey, 28; Rodriguez, 2; Santa Catarina, 2.

San Luis Potosi: Rio Verde, 15; Valles, 5.

Tamaulipas: Alta Mira, 15; near Bagdad, 2; Camargo, 24; Hidalgo, 11; Jaumave, 3; Matamoras, 23; Mier, 1; Nuevo Laredo, 5; Soto la Marina, 11; Tampico, 1; Victoria, 38.

Texas: Arcadia, 1; Austin Bayou, near Alvin, 2; Bee County, 1; Beeville, 1; Benbrook, 1; Blocker Ranch, 1; Brownsville, 82; East Caranchua Creek, 1; Comstock, 4; Concho County, 3; Corpus Christi, 1; Decatur, 1; Del Rio, 9; Deming Station, 3; Dickinson Bayou, 2; Eagle Pass, 7; El Blanco, 1; Elliotts, 1; Fort Clark, 69; Fort Lancaster, 5 (aberrant); Gainesville, 3; Henrietta, 1; Juno, 1; Langtry, 2; Laredo, 2; 35 miles northwest of Laredo, 1; Lomita Ranch, 1; Mason, 7; Matagorda, 5; Nueces Bay, 7; Oconnorport, 1; Presidio, County, 4; Rio Grande City, 1; Rockport, 40; Rock Springs, 7; 22 miles west of Rock Springs, 2; Runge, 1; San Antonio, 63; San Diego, 3; Santa Tomas, 9; Velasco, 8; Waring, 1.

PEROMYSCUS LEUCOPUS MESOMELAS Osgood.

(Pl. III, fig. 4.)

Peromyscus texanus mesomelas **Osgood, Proc. Biol. Soc. Wash., XVII, pp. 57–58, March 21, 1904.**

Type locality.—Orizaba, Veracruz, Mexico.

Geographic distribution.—Humid tropics of central Veracruz and northern Puebla, Mexico.

Characters.—Most similar to *P. l. texanus;* color darker; tail shorter; hind foot larger; a small pectoral spot present; adolescents with an intense black dorsal stripe.

Color.—Adult: General effect of upperparts pale Prout brown, produced by fawn ground color with a liberal mixture of dusky; sides practically unicolor with back; no definite dusky markings about head; underparts creamy white, except a small but distinct pectoral spot of fawn color; ears dusky with whitish edges; feet white, 'ankles' dusky brownish; tail bicolor. Immature: Similar in general to adult, but more sooty; sides dark mouse gray, tinged with fawn and bordered by a narrow fawn-colored lateral line; a broad stripe in median dorsal region intense black; 'ankles' sooty; tail indistinctly bicolor.

Skull.—Similar to that of *P. l. texanus*, but with braincase averaging slightly larger and wider; nasals rather long and palatine slits usually corresponding.

Measurements.—Type: Total length, 169; tail vertebræ, 76; hind foot, 23; ear from notch (dry), 13.5.

Type specimen.—No. 58210 U. S. National Museum, Biological Survey Collection. ♂ adult. Jan. 20, 1894. E. W. Nelson and E. A. Goldman. Specimen in good condition.

Remarks.—Although this form is very well characterized, there seems to be no doubt that it is connected, through *P. l. texanus*, with *P. l. tornillo* and others of the same group. Specimens from Rio Verde, San Luis Potosi, are quite evidently intermediate, and a series from Metlaltoyuca, Puebla, while distinctly referable to *mesomelas*, shows some tendencies toward *texanus*. *P. mesomelas* is also related to *P. affinis*, which is a much paler form and not apt to be confused with it. Like *texanus* and *affinis*, it has short and relatively harsh pelage somewhat different from that of most other Mexican species.

Specimens examined.—Total number 34, from localities in Mexico, as follows:

Puebla: Metlaltoyuca, 15.

Veracruz: Mirador, 1; "Mexico" (Salle) 5; Orizaba, 10; Rio Blanco, 2 (not typical); San Andres Tuxtla, 1.

PEROMYSCUS LEUCOPUS CASTANEUS Osgood.

Peromyscus texanus castaneus Osgood, Proc. Biol. Soc. Wash., XVII, pp. 58–59, Mar. 21, 1904.

Type locality.—Vicinity of Yohaltun, Campeche, Peninsula of Yucatan, Mexico.

Geographic distribution.—Known only from the vicinity of the type locality.

Characters.—Similar to *P. l. mesomelas*, but smaller and more ferruginous; underparts without pectoral spot; adolescents without black dorsal stripe; skull and teeth small.

Color.—Type, in fresh pelage: General color of upperparts between Prout brown and burnt umber, clearer on sides, darker on back; ground color rich dark fawn; no definite lateral line; underparts pure white; feet white, 'ankles' brownish. Topotype No. 107982, in slightly worn pelage: Sides and upperparts nearly uniform cinnamon rufous, with scarcely any dusky admixture and only a narrow line on back somewhat deeper colored than rest of upperparts. Immature: As in adult, but grayer.

Skull.—Rather small and light; braincase relatively narrow; nasals and palatine slits short; molar teeth small; otherwise similar to *P. l. mesomelas.*

Measurements.—Average of 10 adult topotypes: Total length, 163 (156–169); tail vertebræ, 73 (68–79); hind foot, 21.5 (20–22); ear from notch (dry), 12.5 (11.3–13.6).

Type specimen.—No. 107980 U. S. National Museum, Biological Survey Collection. ♂ adult. December 19, 1900. E. W. Nelson and E. A. Goldman. Specimen practically perfect.

Remarks.—*P. l. castaneus* is slightly darker than *P. l. cozumelae*, which is closely related. *P. cozumelae* differs chiefly in larger size and heavier teeth. No satisfactory specimens from the humid tropical region between Orizaba and Yohaltun are at hand, but *castaneus* is not sufficiently different from *mesomelas* to warrant full specific rank. *P. affinis* is a related form of the adjacent arid tropics, and much paler than either *castaneus* or *mesomelas.*

Specimens examined.—Total number 25, all from the type locality.

PEROMYSCUS LEUCOPUS AFFINIS (Allen).

Hesperomys (*Vesperimus*) *affinis* Allen, Proc. U. S. Nat. Mus., XIV, pp. 195–196, July 24, 1891.

Peromyscus affinis Allen and Chapman, Bull. Am. Mus. Nat. Hist., N. Y., IX, p. 7, Feb. 23, 1897.

Peromyscus musculoides Merriam, Proc. Biol. Soc. Wash., XII, p. 124, Apr. 30, 1898.—Cuicatlan, Oaxaca, Mexico.

Type locality.—Barrio,[a] Isthmus of Tehuantepec, Oaxaca, Mexico.

Geographic distribution.—Arid tropical parts of southern and central Oaxaca; northeast to southern Veracruz and parts of Yucatan.

Characters.—Similar to *P. l. texanus* and *P. l. mesomelas*, but slightly larger; color much as in *texanus*, decidedly paler than in *mesomelas* or *castaneus;* skull slightly larger and heavier than in *mesomelas.*

Color.—Almost exactly as in *P. l. texanus;* general color of upper parts fawn, in fresh pelage mixed with dusky, forming an imperfect dark dorsal stripe, and in worn pelage mixed with cinnamon; underparts creamy white, rarely with a small fawn pectoral spot; feet white, 'ankles' pale brownish; tail brownish fawn above, white below.

Skull.—Similar to that of *P. l. mesomelas*, but somewhat larger; anterior part of zygoma heavier; infraorbital plate of zygoma wider; interorbital constriction averaging wider.

Measurements.—Two adult males from Tehuantepec, Oaxaca: Total length, 182, 180; tail vertebræ, 84, 81; hind foot, 24, 22. Average of 10 adults from Cuicatlan, Oaxaca: 185; 84.5; 22.5; ear from notch (dry), 14.3 (13.5–15).

Type specimen.—No. $\frac{9382}{8665}$ U. S. National Museum. ♀ adult. Oct. 30, 1868. F. Sumichrast. Skin soiled and discolored, particularly on underparts; right hind foot broken off and tied on with thread; tail vertebræ not removed. Labeled in Coues's hand "*melanophrys?*" and later "*mexicanus?*" by someone else. Skull in fair condition, but still with considerable flesh adhering to it; right zygoma slightly broken.

Remarks.—Externally, this form is scarcely distinguishable from *P. l. texanus.* It averages slightly larger, and its skull is more elongate, besides being decidedly heavier in the infraorbital region. Its intergradation with *P. l. mesomelas*, the form of the adjacent humid tropics, is scarcely to be doubted. However, two specimens from Otatitlan, Veracruz, near the edge of the humid region, seem distinctly referable to *affinis.*

Specimens examined.—Total number 76, from localities in Mexico as follows:

Oaxaca: Barrio, 3; Cuicatlan, 16; Guichicovi, 1; Huilotepec, 5; Reforma, 10; Santa Efigenia, 1; Tehuantepec, 5.

Veracruz: Otatitlan, 2; Pasa Nueva, 22.

Yucatan: Chichenitza, 11 (approaching *castaneus*).

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[a] Barrio usually means a suburb. Sumichrast's specimens are labeled thus: "Tehuantepec (Barrio)." This might mean a suburb of the city of Tehuantepec, but since there is a town called Barrio near the middle of the Isthmus of Tehuantepec, and since Sumichrast labeled specimens from other towns in Oaxaca in this manner, it seems probable that the town of Barrio was meant. As the same species occurs at both places the question is not important.

PEROMYSCUS LEUCOPUS COZUMELAE (MERRIAM).

(Pl. III, fig. 3.)

Peromyscus cozumelæ Merriam, Proc. Biol. Soc. Wash., XIV, p. 103, July 19, 1901.

Type locality.—Cozumel Island, off coast of Yucatan, Mexico.

Geographic distribution.—Cozumel Island.

Characters.—Size about as in *P. l. affinis;* color about intermediate between that of *affinis* and of *castaneus;* skull larger and heavier than in *castaneus;* teeth heavier than in *affinis.*

Color.—Slightly duller and paler than in *P. l. castaneus;* otherwise similar; slightly darker and more ferruginous than in *P. l. affinis.*

Skull.—Decidedly larger and heavier than in *P. l. castaneus;* teeth heavier; audital bullæ larger; infraorbital region heavier. Most similar to that of *P. l. affinis;* teeth averaging slightly larger; braincase averaging a trifle shallower; audital bullæ usually a trifle larger.

Measurements.—Average of 10 adult topotypes: Total length, 184 (163–198); tail vertebræ, 83.8 (76–90); hind foot, 23.3 (22–24); ear from notch (dry) 14.6 (13.7-15.7).

Type specimen.—No. 108449 U. S. National Museum, Biological Survey Collection. ♂ adult. Apr. 11, 1901. E. W. Nelson and E. A. Goldman. Specimen in perfect condition.

Remarks.—*P. l. cozumelae* is so closely related to *P. l. castaneus* and *P. l. affinis* that it seems best to treat it as a subspecies. It is most closely similar to *P. l. affinis*, being only a shade darker and having no constant cranial distinctions. Some skulls of *cozumelae* are absolutely indistinguishable from others of *affinis.*

Specimens examined.—Total number 19, all from the type locality.

Key to subspecies of Peromyscus gossypinus.

- Size large; hind foot 22–26. Chiefly north of peninsular Florida.
  - Size very large; color averaging paler. Northern Alabama to eastern Texas. ---- *P. g. megacephalus.*
  - Size not so large; color averaging darker. Southern Virginia to northern Florida, west to Louisiana ---- *P. gossypinus.*
- Size smaller; hind foot 20–22. Chiefly peninsular Florida and adjacent islands.
  - Darker. Mainland ---- *P. g. palmarius.*
  - Paler. Insular ---- *P. g. anastasae.*

PEROMYSCUS GOSSYPINUS (LE CONTE). COTTON MOUSE.

(Pl. III, fig. 2.)

Hyp [*udaeus*] *gossipinus* Le Conte, McMurtrie's Cuvier's Animal Kingdom, I, append., p. 434, 1831—*nomen nudum.*

?*Mus carolinensis* Aud. & Bach., Jour. Acad. Nat. Sci. Phila., pp. 306–307, 1841. South Carolina. (Indeterminate.)

Hesperomys gossypinus Le Conte, Proc. Acad. Nat. Sci. Phila., VI, pp. 411–412, 1853.

Hesperomys cognatus Le Conte, Proc. Acad. Nat. Sci. Phila., p. 442, 1855. Georgia.

Peromyscus gossypinus Rhoads, Proc. Acad. Nat. Sci. Phila., p. 189, 1896.

Peromyscus gossypinus nigriculus Bangs, Proc. Biol. Soc. Wash., X, pp. 124–125, Nov. 5, 1896.—Burbridge, Plaquemines Parish, Louisiana.

Type locality.—Le Conte Plantation, near Riceboro, Liberty County, Ga.

Geographic distribution.—Lowlands of the southeastern United States from the Dismal Swamp, Virginia, to northern Florida and west to Louisiana. Lower Austral zone.

Characters.—Size medium or rather large (hind foot 22–24); tail shorter than head and body, not very sharply bicolor, clothed with rather short hairs; color rather dark, in most pelages with an extensive dark dorsal area. Most similar in general appearance and character of pelage to *P. leucopus*, but larger and darker.

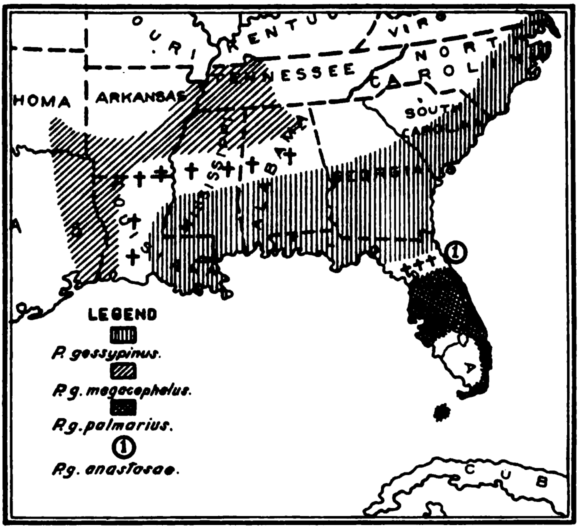

FIG. 3.—Distribution of *Peromyscus gossypinus* and subspecies.

Color.—Unworn pelage: Ground color of upperparts bright rufescent cinnamon between the cinnamon and cinnamon rufous of Ridgway; entire upperparts heavily mixed with blackish appearing as coarse lines which, although close together, do not blend with the ground color; dusky mixture predominating on middle of back, appearing as a broad stripe from the shoulders to the base of the tail; top of head and shoulders somewhat grayer than sides; a narrow orbital ring slightly widened anteriorly and posteriorly; ears dusky brownish, scarcely or not at all edged with whitish; underparts white or creamy white usually with a very strong creamy tinge in pectoral region; feet white; forearm often dusky or slightly rufescent and dusky; tail blackish brown above, white below. Worn pelage: Sides bright cinnamon rufous or deep russet slightly toned down by a thin mixture of darker pale-brownish hairs; middle of back darker, varying from russet to Prout brown. Adolescent pelage: Ground color of upperparts pale cinnamon or isabella color thickly mixed with blackish which predominates on dorsum and is rather sharply contrasted with the sides.

Skull.—Rather large and heavy; zygomata heavy anteriorly; premaxillae slightly expanded laterally; palatine slits rather broadly open, their outer sides not parallel; interpterygoid fossa broad and square anteriorly. Similar in general to that of *leucopus*, but larger throughout; teeth decidedly longer.

Measurements.—Two adult topotypes: Total length, 160, 171; tail vertebræ, 72, 71; hind foot, 24, 23; ear from notch (dry), 15.7. Average of 12 adults from St. Marys, Ga.: 177.6; 70; 22.3. Of 10 adults from Dismal Swamp, Virginia: 181.6 (175–190); 81 (70–88); 22.9 (22–24). Of 5 adults from Belair, La.: 178 (170–184); 74.6 (71–78); 22.7 (22–23).

Type specimen.—No type was designated in the original description. Several specimens collected in Georgia by Le Conte have been in the U. S. National Museum. No. 4704 remains there still and may perhaps be regarded as a cotype, though there is no positive evidence that it was in Le Conte's hands at the time the description was written. It is in fair condition. The skull and tail vertebræ are inside the skin. It was catalogued April 3, 1861. No. 752 Collection of Academy of Natural Sciences, Philadelphia, also has claims. It is labeled, "Georgia Dr. Le Conte," and was catalogued January, 1860. No. 5275, Museum of Comparative Zoology, Cambridge, Mass., is still another.

Remarks.—Although evidently very closely related to *leucopus*, *P. gossypinus* appears to be distinct. Both occur at the same localities through much of the northern part of the range of *gossypinus* and everywhere seem to maintain themselves distinct. The only certain character for distinguishing them in all conditions of pelage is that of size, for although *gossypinus* is almost always darker in unworn pelage, specimens occur which are very similar to *leucopus* in certain stages of worn pelage. The skull and teeth of *gossypinus* are of the same general character as those of typical *leucopus* but decidedly larger, although if specimens of the smaller forms of *gossypinus* be compared with those of larger forms of *leucopus* scarcely any difference in size appears. The subspecies of *gossypinus* are all slight, differing mainly by average characters of size and amount of dusky mixture in the pelage. Typical *gossypinus* itself is the darkest form and '*nigriculus*' does not appear to differ from it. A single specimen from Bogue Beach, N. C., is very pale and may represent a slight coast form.

Two specimens now in the British Museum and recently received in the Tomes collection may perhaps be considered as paratypes of Le Conte's *Hesperomys cognatus*. On the old labels is written "From Major Le Conte, Feb. 1858. *Hesperomys cognatus*." Both are typical examples of *Peromyscus gossypinus*.

Specimens examined.—Total number 450, from localities as follows:

Alabama: Castleberry, 3; Elmore, 1; Mobile Bay, 10; Montgomery, 2.

Florida: Amelia Island, 1; Burnside Beach, 7; Cartersville, 3; Gainesville, 58; Jacksonville, 1; Milton, 1; New Berlin, 35; Summer Haven, 1; Whitfield, 14.[a]

Georgia: Augusta, 3; Barrington, 6; Butler, 4; Hursman Lake, 2; Montgomery, 9; Pinetucky, 22; Riceboro, 21; St. Marys, 36; Savannah, 2; Sterling, 16.

Louisiana: Belair, 6; Burbridge, 5; Gibson, Terre Bonne Parish, 56; Lecompte, 4; Powhatan Plantation, near Gibson, 28; Houma, 7; Lake Charles, 2; Tallulah, 5.

Mississippi: Bay St. Louis, 7; Washington, 13.

North Carolina: Bertie County, 3; Bogue Beach, 1 (aberrant); Currituck, 2.

South Carolina: Columbia, 2; Georgetown, 1; "South Carolina" (Le Conte), 6.

Virginia: Dismal Swamp, 44.

PEROMYSCUS GOSSYPINUS MEGACEPHALUS (RHOADS).

Sitomys megacephalus Rhoads, Proc. Acad. Nat. Sci. Phila., pp. 254–256, Sept. 25, 1894.

Peromyscus gossypinus mississippiensis Rhoads, Proc. Acad. Nat. Sci., Phila., p. 189, 1896.—Samburg, Tennessee.

Peromyscus gossypinus Bangs, Proc. Biol. Soc. Wash., X, pp. 119–125, Nov. 5, 1896.

Type locality.—Woodville, Ala.

Geographic distribution.—Northern Alabama and western Tennessee, west through Arkansas to eastern Oklahoma, and thence south through eastern Texas and western Louisiana.

Characters.—Similar to *gossypinus* but averaging larger and paler.

Color.—Unworn pelage: Ground color of upperparts slightly lighter than in *gossypinus;* dusky mixture less abundant on sides and less concentrated in middle of back; orbital ring very narrow or obsolete; underparts creamy white. Worn pelage: Slightly paler than in *gossypinus;* sides a lighter shade of russet; dorsum Mars brown to mummy brown, but this less extensive than in *gossypinus.* Adolescent pelage: Quite decidedly paler than in *gossypinus;* sides isabella color mixed with dusky, producing a general effect of broccoli brown tinged with fulvous; dorsum distinctly dusky, but less so than in *gossypinus.*

Skull.—Similar to that of *gossypinus*, but decidedly larger and more elongate; rostrum and nasals longer.

Measurements.—Average of 6 adults from Tennessee: Total length. 183; tail vertebræ, 79.5; hind foot, 24.5; ear from notch (dry), 15.5

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[a] Carnegie Museum.

(15–16.3). Of 6 adults from eastern Texas: 196 (188–205); 84 (78–90); 24 (23–26).

Type specimen.—No. 3585 Collection of Academy of Natural Sciences, Philadelphia. ♂ (?) adult. H. E. Sargent. Specimen in alcohol, except the skull, which has been removed, and which is in fair condition, although not very thoroughly cleaned and somewhat broken about the foramen magnum.

Remarks.—The largest specimens of this form (and perhaps also the palest) come from eastern Texas and Oklahoma. It would therefore be more satisfactory if the type had been obtained from this region. However, the type and specimens from western Tennessee are obviously nearer to the western form than to typical *gossypinus*. Specimens from central Mississippi appear to be intermediate between *megacephalus* and *gossypinus*. The name *megacephalus* was referred to the synonymy of *gossypinus* by Bangs (l. c.), although the type specimen was not examined by him. The skull of this type proves to be too large to belong with *gossypinus*, and although the skin in alcohol can not be trusted for color characters, there seems little doubt that it represents the form recognized by Bangs under the name *mississippiensis*.

Specimens examined.—Total number 62, from localities as follows:

Alabama: Scottsboro, 1; Woodville, 3.
Louisiana: Clarks, 1; Foster, 4.
Oklahoma: Red Oak, 1.
Tennessee: Arlington, 10; Big Sandy, 3; Clarksville, 3; High Cliff, 1; Lawrenceburg, 1; Samburg, 17.
Texas: Jasper, 3; Jefferson, 1; Long Lake, 1; Sour Lake, 11; Texarkana, 1.

PEROMYSCUS GOSSYPINUS PALMARIUS Bangs.

Peromyscus gossypinus palmarius Bangs, Proc. Biol. Soc. Wash., X, p. 124, Nov. 5, 1896.

Type locality.—Oak Lodge, east peninsula, opposite Micco, Brevard County, Florida.

Geographic distribution.—Peninsular Florida.

Characters.—Similar to *gossypinus*, but averaging smaller and paler.

Color.—Unworn pelage: Similar to that of *gossypinus*, but paler; ground color a shade lighter and dusky mixture more sparse, as a rule not so heavily concentrated in the middle of the back; orbital ring very narrow; underparts grayish white to creamy or even yellowish white, rarely with a small fulvous pectoral spot.

Skull.—Similar to that of *gossypinus*, but averaging decidedly smaller; rostrum and infraorbital region lighter; teeth slightly smaller.

Measurements.—Average of 7 topotypes:[a] Total length, 178.8 (172–183); tail vertebræ, 74.5 (69–78); hind foot, 21.1 (20–22); ear from notch (dry), 14.7 (14–15). Of 20 topotypes:[b] 181; 71.8; 21.5.

Type specimen.—No. 3224 Museum of Comparative Zoology, Cambridge, Mass., formerly in collection of E. A. and O. Bangs. ♀ adult. Feb. 23, 1895. O. Bangs. Specimen in good condition.

Remarks.—Specimens from various parts of peninsular Florida are constantly smaller than typical *gossypinus*. The pale color shown by many specimens is not so constant and can be considered only an average character. It is more pronounced in specimens from the coast beaches than in those from the interior, but on the whole it seems best to refer all the material from peninsular Florida to one form.

The type of *palmarius* and a very small percentage of the large series of topotypes are unusually pale and scarcely distinguishable from comparable specimens of *anastasae*. If further study of local conditions at the type locality should prove that two forms occupying different habitats are found together there, it would then seem to be necessary to use the name *palmarius* for the pale form now called *anastasae* and supply a new name for the darker and more widely distributed form. However, the great preponderance of dark specimens from the type locality tends to indicate that the type is probably an aberrant specimen rather than the representative of a well-defined form. The case might be construed also to the effect that pale coast forms are undergoing parallel differentiation at several points and that the same character (paleness) has been established independently on Anastasia and Cumberland islands and is only in its incipiency on the peninsula opposite Micco.

Specimens examined.—Total number 523, from localities as follows:

Florida: Anclote River, 32 (head 30, 12 miles up 2); Argo, 3; Auburndale, 3; Blitch Ferry, Citrus County, 21; Canaveral, 18; Cape Canaveral, 2; Catfish Creek, 4; Charlotte Harbor, 2; Citronelle, 3; Crystal River, 13; Eden, 1; Enterprise, 33; Eau Gallie, 2; Flamingo, 26; Fort Kissimmee, 8; Glenwood, 1; Georgiana, 2; Gulf Hammock, 2; Jupiter Island, 4; Kissimmee, 9; Lake Arbuckle, 1; Lake Harney, 24; Lake Hatchehaw, 4; Lake Kissimmee, 3; Lake Worth, 7; Miami, 51; Micco, 13; Mullet Lake, 25; Oak Lodge, opposite Micco, 161; Planter, 2; Port Richey, 2; Sawgrass Island, 4; Sebastian, 5; Tarpon Springs, 32.

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[a] Biological Survey Collection.

[b] Bangs collection.

PEROMYSCUS GOSSYPINUS ANASTASAE (Bangs).

Peromyscus anastasae Bangs, Proc. Bost. Soc. Nat. Hist., XXVIII, pp. 195-196, March, 1898.

Peromyscus insulanus Bangs, *supra cit.*, pp. 196-197—Cumberland Island, Georgia.

Type locality.—Point Romo, Anastasia Island, Florida.

Geographic distribution.—Sandy islands (possibly also parts of the mainland) of the eastern coast of Georgia and Florida.

Characters.—Size about as in *palmarius;* color paler than in *gossypinus* or *palmarius.*

Color.—Upperparts pale ochraceous buff rather lightly mixed with dusky, which is slightly or not at all concentrated in the mid-dorsal region; orbital ring nearly or quite obsolete; underparts white almost entirely concealing undercolor; ears dusky; tail bicolor, brownish dusky above, white below. Adolescents paler, more drabby, than in *palmarius.*

Skull.—Practically as in *palmarius*, somewhat smaller than in *gossypinus.*

Measurements.—Type: Total length, 165; tail vertebræ, 69.5; hind foot, 21; ear from notch, 16.5. Average of 6 adult topotypes: 167.5; 69.5; 21.4. Average of 3 adults from Cumberland Island, Georgia: 171.7; 68; 21.6.

Type specimen.—No. 7179 Museum of Comparative Zoology, Cambridge, Mass., formerly in collection of E. A. and O. Bangs. ♀ adult. Feb. 15, 1897. O. Bangs. Specimen in good condition.

Remarks.—Although the pale forms from Anastasia and Cumberland islands, respectively, are entirely isolated from each other and from the mainland forms, they seem to be absolutely alike and also are not different from certain aberrant (intermediate?) specimens from the mainland. Moreover, the mainland specimens most similar to them are not from localities immediately adjacent to the islands in question, specimens from St. Marys, Ga., Burnside Beach, Fla., etc., being typical *gossypinus.*

Specimens examined.—Total number 54, from localities as follows:

Florida: Anastasia Island, 18.
Georgia: Cumberland Island, 36.

Key to subspecies of Peromyscus boylei.

a. Habitat western United States and northern Lower California.
  b. Size smaller; hind foot 21-23. Western Texas to Pacific coast.
    1. Color darker. Northern Sierra Nevada Mountains and coast ranges north of San Francisco Bay -- *P. boylei*
    2. Color paler. Coast region of southern California to northern Lower California; east to Colorado and western Texas ---------------- *P. b. rowleyi*
  bb. Size larger; hind foot 22-25. Arkansas to central Texas -------- *P. b. attwateri*
aa. Habitat Mexico (except Lower California) and Guatemala.
  b. Habitat western Mexico and adjacent islands, chiefly west of the 102d meridian.
    c. Size smaller; hind foot 21-23; color paler, chiefly grayish isabella color or pale ochraceous buff ---------------------------------- *P. b. rowleyi*

cc. Size larger; hind foot 22–26; color darker, chiefly rich tawny or ochraceous.
  d. Larger. Tres Marias Islands .... *P. b. madrensis*
  dd. Not so large. Mainland of Mexico.
    1. Molars large; maxillary toothrow about 5; hind foot extensively dusky. Oaxaca and Guerrero .... *P. b. evides*
    2. Molars moderate; maxillary toothrow less than 5; hind foot less extensively dusky. Southern Sonora to Jalisco .... *P. b. spicilegus*
bb. Habitat eastern and southern Mexico and Guatemala, chiefly east of the 102d meridian.
  c. Color largely rich tawny or ochraceous; hind foot extensively dusky; molars large; maxillary toothrow about 5.
    1. Color darker and richer. Veracruz and Puebla .... *P. b. aztecus*
    2. Color paler. Oaxaca and Guerrero .... *P. b. evides*
  cc. Color duller and more mixed with dusky; hind foot less extensively dusky (usually white except tarsal joint); molars smaller; maxillary toothrow less than 5 .... *P. b. levipes*

PEROMYSCUS BOYLEI (BAIRD).

(Pl. IV, fig. 1; pl. VII, fig. 9.)

Hesperomys boylii Baird, Proc. Acad. Nat. Sci. Phila., VII, pp. 335–336, April, 1855.

Sitomys robustus Allen, Bull. Am. Mus. Nat. Hist., V, pp. 335–336, Dec. 16, 1893—Lakeport, Lake County, Calif.

Peromyscus boylii Mearns, Proc. U. S. Nat. Mus., XIX, p. 139. May 25, 1896.

Type locality.—Middle Fork American River, Eldorado County, Calif., near site of present town of Auburn.

Geographic distribution.—West slopes of the Sierra Nevada mountains from the vicinity of Yosemite north to Mount Shasta, thence along the east slopes of the coast ranges nearly to San Francisco Bay. Upper Sonoran and Transition zones.

Characters.—Size medium (hind foot 21–23), about as in *truei*, larger than in *gambeli;* tail long, equal to or longer than head and body, somewhat penicillate and rather coarsely hairy throughout, the annulations usually being obvious; ears medium, smaller than in *truei* and *gilberti;* proximal two-fifths of under side of hind foot hairy; coloration not peculiar, much as in *gilberti* and *gambeli;* preauricular tufts without white.

Color.—Unworn pelage: General effect of upperparts hair brown to sepia; ground color pale buffy cinnamon heavily and uniformly mixed with dusky without any decided concentration in middle of back; lower face, arms, and narrow lateral line nearly clear pale ochraceous buff; a narrow blackish orbital ring; ear tufts same as upperparts, never containing white hairs, but often showing a soft blackish tuft at the base of the upper margin of the ear; ears dusky narrowly edged with whitish; underparts creamy white; feet white, 'ankles' rather extensively dusky; tail brownish above, white below. Worn pelage: Upperparts varying from Mars brown and russet to pale cinnamon uniformly mixed with brownish dusky, which varies in amount according to degree of wear; orbital ring, dark marking on hind legs and 'ankles,' and upper side of tail paler, more brownish, than in unworn pelage. Adolescent pelage: General effect of upperparts varying from drab to hair brown with a tinge of fawn, a pale ochraceous buff lateral line usually evident.

Skull.—Size medium, decidedly larger than in *gambeli* and *rubidus* but somewhat smaller than in *truei* and *gilberti;* rostrum depressed anteriorly; zygomatic width least anteriorly; infraorbital region relatively weak; braincase somewhat rounded but smaller and less inflated than in *truei;* audital bullæ decidedly smaller and less orbicular than in *truei;* teeth medium, much larger than in *gambeli* and *rubidus*, about equaling those of *truei.*

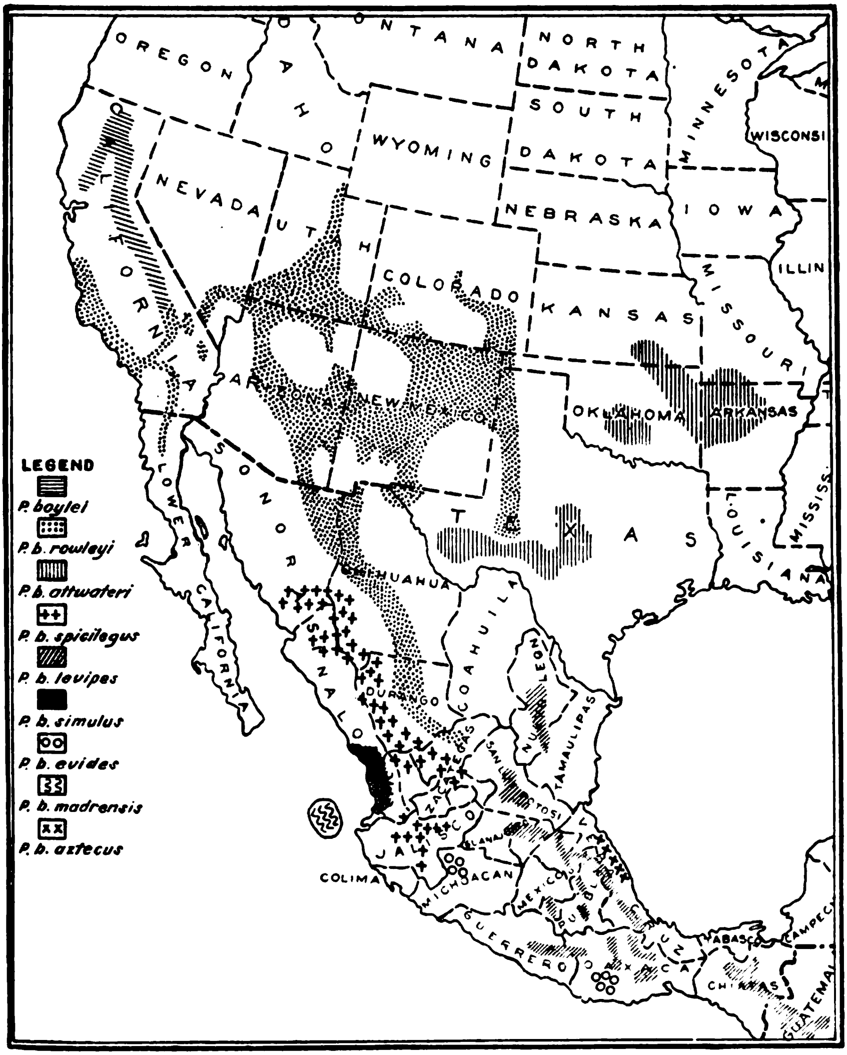

FIG. 4.—Distribution of *Peromyscus boylei* and subspecies.

Measurements.—Average of 10 adult topotypes: Total length, 197 (183–202); tail vertebræ, 103 (92–112); hind foot, 22 (21–23); ear from notch (dry), 16.4 (15.3–17.5).

Type specimen.—No. $\frac{356}{1276}$ U. S. National Museum. Collected by Dr. C. C. Boyle. Entered in Museum catalogue in 1854. Skin formerly in exhibition series, now removed from stand but still in crouching position, as originally mounted, with tail raised over back. Color much faded from exposure to light, chiefly pale buffy cinnamon. Tail somewhat cracked, but coarse annulations and hairy covering distinct. A large patch of fur gone from right side of body. Skull with zygomata somewhat broken, otherwise perfect. Tail vertebræ preserved with skull.

Remarks.—Typical *P. boylei* appears to be confined to the State of California. There is no obvious reason why it should not occur also in the mountains of southern Oregon, but considerable collecting there has failed to reveal it. However, although it sometimes ranges into the Canadian zone, it is evidently of southern extraction and is connected with various intergrading forms which range throughout most of Mexico and even into Guatemala. Although occasionally found in the valleys, it is much more common in the mountains. From other species of California, it may be recognized usually by its coarsely haired penicillate tail, medium-sized ears, and cranial characters. *P. boylei* is perhaps most apt to be confused with *gilberti*, which approaches it in size and color very closely. Its ears average smaller than in *gilberti*, its tail is more coarsely haired, and the coarser annulations are more exposed. If external characters fail, it may be distinguished from *gilberti* with certainty by its decidedly smaller audital bullæ.

In the southern Sierra region *boylei* intergrades with the paler form *rowleyi*, and many specimens may be found that resemble one about as much as the other. A series from the lava beds of Fall River Valley, Shasta County, are unusually dark colored, but the divergence is slight.

Specimens examined.—Total number 254, from localities as follows:

California: Middle Fork American River, near Auburn, 34; Baird, 4; Bartlett Springs, 2; Battle Creek, 4; Berger Creek, 1; Beswick, 6; Bully Choop Mountains, 5; Cassel, 2; Chico (10 miles northeast), 9; Chinese, 2; Coarsegold, 2; Coulterville, 1; Dana, 2; Downieville, 3; Eel River, 4; Eel River, near South Yolla Bolly Mountain, 19; Etna, Salmon Mountains, 6; Fall Lake, Fall River Valley, 6 (aberrant); Forest Hill, Placer County, 2; Fresno Flat, 7; Fyffe, 4; Guenoc, 2; Hurleton, 10; Lakeport, 1;[a] Leesville, 8; Lower Lake, 14; Milford, 3; Montgomery, 1; Mount Shasta, 1; Mountain House, Butte County, 4; Oroville, 2; Quincy, 2; Salt Springs, 6; Scott Valley, 4; Sierra

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[a] Collection of Leland Stanford, jr., University. Type of '*robustus*.'

City, 1; Slippery Ford, 10; Snow Mountain, Colusa County, 36; Stillwater, 2; Susanville, 1; Tower House, 1; Upper Lake, 2; Yosemite, 18.

PEROMYSCUS BOYLEI ROWLEYI (ALLEN).

Sitomys rowleyi Allen, Bull. Am. Mus. Nat. Hist., N. Y., V, pp. 76–78, Apr. 28, 1893.

Sitomys major Rhoads, Am. Naturalist, XXVII, p. 831, Sept., 1893.—Squirrel Inn, San Bernardino County, Calif.

Sitomys rowleyi pinalis Miller, Bull. Am. Mus. Nat. Hist., N. Y., V, pp. 331–334, Dec. 16, 1893.—Granite Gap, Grant County, N. Mex.

Peromyscus boylii rowleyi Mearns, Proc. U. S. Nat. Mus., XIX, p. 139, May 25, 1896.

Peromyscus boylii penicillatus Mearns, Proc. U. S. Nat. Mus., XIX, p. 139, May 25, 1896.—Franklin Mountains, near El Paso, Tex.

Peromyscus gaurus Elliot, Field Columbian Museum, Chicago, Zool. Ser., III, pp. 157–158, Apr., 1903.—San Antonio, San Pedro Martir Mountains, Lower California.

Peromyscus parasiticus Elliot, Field Columbian Museum, Chicago, Zool. Ser., III, p. 244, Jan., 1904.—Lone Pine, Calif.

Peromyscus metallicola Elliot, Field Columbian Museum, Chicago, Zool. Ser., III, p. 245, Jan., 1904.—Providencia Mines, Sonora, Mexico.

Type locality.—Noland Ranch, San Juan River, Utah.

Geographic distribution.—Mountains of southern California, northern Lower California, southern Nevada, Utah, Colorado, Arizona, New Mexico, western Texas, and south in Mexico chiefly on the eastern slopes of the Sierra Madre to central Zacatecas and northwestern San Luis Potosi.

Characters.—Size, proportions, and cranial characters practically as in *P. boylei*; color paler.

Color.—Unworn pelage: General effect of upperparts wood brown to isabella color; ground color ochraceous buff uniformly sprinkled with dusky; sides like back, except a relatively broad lateral line of ochraceous buff unmixed with dusky; nose and postorbital region grayish; narrow orbital ring blackish; ears dusky, faintly edged with whitish; underparts cream white; tail dusky brownish above, white below; feet white, dusky of hind legs extending to tarsal joints, but not sharply contrasted. Worn pelage: General effect of upperparts varying from clay color to vinaceous cinnamon and from that to cinnamon (No. 20, Pl. III, Ridgway), quite decidedly paler than in *boylei*.

Skull.—Practically as in *boylei*, possibly averaging a trifle larger.

Measurements.—Average of 10 adults from Bluff City, San Juan River, Utah: Total length, 191 (180–207); tail vertebræ, 99 (91–109); hind foot, 21.6 (21–23); ear from notch (dry), 17.2 (16.6–18).

Type specimen.—No. $\frac{5070}{3960}$ American Museum of Natural History, New York. ♀ adult. April 20, 1892. Chas. P. Rowley. Skin in fair condition, in bright slightly worn pelage; end of tail slightly injured. Skull in good condition.

Remarks.—This pale form of *boylei* has a wide range throughout which it shows comparatively little variation. Nearly all California series of *rowleyi* are the merest shade deeper colored than typical, thus being intermediate between *boylei* and *rowleyi.* This includes especially specimens from the coast valleys and low ranges of mountains from Monterey County to northwestern Lower California. The difference is so slight, however, that it can scarcely be detected in small series or individuals and is apparent only on comparison of very large series. Specimens from the east side of the southern Sierras and also those from the San Bernardino Mountains, including the type of '*major*,' do not show the slightest tendency toward *boylei*, but are practically identical with *rowleyi.* On the whole it seems best to include all southwestern specimens of this group under the name *rowleyi.* The difference between typical *boylei* and *rowleyi* is only in shade of color, and the attempt to recognize an intermediate shade does not seem advisable. Intergradation with *attwateri* is shown by specimens from western Texas, which are large but pale colored. The type of '*penicillatus*' is an abnormally pale individual, but a series from the Franklin Mountains near the type locality does not differ from typical *rowleyi.* Specimens from the type locality of '*pinalis*' do not differ from others in comparable condition from the vicinity of the type locality of *rowleyi.*

Most Mexican specimens of *rowleyi* show slight tendencies toward *spicilegus*, being slightly deeper colored. Specimens from Lower California ('*gaurus*') have rather long tails but no longer than are often found in various other parts of the range of the form.

As *boylei* is apt to be confused with *gilberti*, so also is *rowleyi* similar to *truei.* As a rule, however, *rowleyi* has decidedly smaller ears, less silky pelage, and a coarser tail than *truei* and hence may be distinguished without recourse to the skull, in which the audital bullæ are much smaller than in *truei.* It also much resembles *nasutus*, which is a larger species with a longer rostrum.

Specimens examined.—Total number 1,270, from localities as follows:

Arizona: Apache County, 1; Bradshaw City, 13; Chiricahua Mountains, 39; Fort Bowie, 5; Fort Huachuca, 6; Fort Whipple, 1; Grand Canyon, 6; Holbrook, 1; Huachuca Mountains, 133; Hualpai Mountains, 8; Nogales, 6; Oracle, 1; Painted Desert, Little Colorado River, 1; Pinal County, 14; Prescott, 5; Santa Catalina Mountains, 8; Show Low, 2; Walnut, 1; Warsaw, 1; White Mountains, 2.

California: Aguanga, 2; Arroyo Seco, near Paraiso Springs, 6; Ballena, 4; Bergman, 2; Balcon Mountain, 1; Camp Badger, 4; Carmel River, 40; Carpenteria, 2; Chihuahua Mountains, San Diego County, 2; Coahuila Mountains, Riverside County, 1; east base Coast Range, San Diego County, 1; Cone Peak, Monterey County, 4; Cuyamaca, 7;

Densmores, Riverside County, 7; Dulzura, 2; Eshom Valley, Tulare County, 2; Gaviota Pass, 11; Glendora, 1; Hemet Mountain, 3; Independence Creek, 2; Jacumba, 3; Julian, 1; Kaweah, 1; Kaweah River, 2; Kern River, 13; Kern River Lakes, 1; Laguna Mountains, San Diego County, 6; Laguna, 11; Las Virgines Creek, 1; Lone Pine, 18; Milo, 2; Mission Santa Ynez, 7; Mohave, 1; Mono Flats, Santa Barbara County, 4; Morans, 1; Mountain Spring, San Diego County, 1; Nellie, 2; Nordhoff, 6; Oak Grove, 1; Olancha Creek, 2; Owens Lake, 15; Pine Valley, Monterey County, 8; Piute Mountains, 2; Pleyto, 1; Porterville, 3; Pozo, 10; Providence Mountains, 3; San Bernardino Mountains, 37; San Emigdio Canyon, 7; San Gabriel Mountains (Strain Camp), 12; San Jacinto Mountains, 20; San Miguelito, 1; San Rafael Mountains, Santa Barbara County, 18; San Simeon, 11; Santa Ana Mountains, 2; Santa Lucia Peak, 3; Santa Paula, 1; Santa Ynez River, 6; Santa Ysabel, 27; Smith Mountain, San Diego County, 1; south fork Kern River, 13; Springville, 5; Sur River, 4; Tassajara Creek, 22; Tehachapi, 4; Tejon Canyon, 4; Three Rivers, 23; Ventura River, 14; Walker Pass, 2; Witch Creek, 6; Zaca Lake, 6.

Chihuahua: Balleza, 3; Colonia Garcia, 11; Colonia Juarez, 2; Parral, 5; San Luis Mountains, 2.

Colorado: Arboles, 1; Cortez, 2;[a] Coventry, 5; Mesa Verde, 2; Salida, 1.[a]

Durango: Arroyo de Bucy, 1; Cienega de las Vacas, 8; Durango, 1; La Boquilla, 6; Matalotes, 7; Rancho Santuario, 24; San Gabriel, 16.

Lower California: Aguaje de las Fresas, 7; Hanson Laguna, 10; La Grulla, 3; Nachoguero Valley, 10; Palomar, 3; Rancho San Antonio, 16; San Matias Pass, 2; San Pedro Martir Mountains, 6.

Nevada: Charleston Mountains, 5.

New Mexico: Alma, 4; Animas Peak, 17; Animas Valley, 4; Aztec, 12; Big Hatchet Mountains, 16; Burro Mountains, 6; Capitan Mountains, 23; Clayton, 4; Copperton, 1; Corona, 12; Dry Creek, Socorro County, 2; Emery Peak, 4; Florida Mountains, 3; Folsom, 6; Fort Wingate, 1; Gallo Canyon, 2; Gallup, 1; Gila National Forest, 2; Glenwood, 1; Glorieta, 1; Granite Gap, 1; Jicarilla Mountains, 23; La Plata, 1; Las Vegas, 5; Manzano Mountains, 40; Mogollon Mountains, 2; Organ City, 2; Organ Mountains, 8; Raton Range, 4; San Andres Mountains, 7; Sandia Mountains, 17; San Pedro, 3; Santa Rosa, 8; Sierra Grande, 5; Silver City, 1; Tucumcari, 1.

San Luis Potosi: Mountains near Jesus Maria, 4.

Sonora: Huasavos Mountains, 10; Providencia Mines, 7; San Luis Mountains, 4; San José Mountains, 4; Santa Cruz River, 2; Sierra Patagones, 20.

Texas:[b] Big Spring, 1; Franklin Mountains, 12; Ozona, 3; Rock Springs, 1.

Utah: Bluff, 45; Noland Ranch, 10; Ogden, 2; Santa Clara Creek, 2.

PEROMYSCUS BOYLEI ATTWATERI Allen.

Peromyscus attwateri Allen, Bull. Am. Mus. Nat. Hist., N. Y., VII, pp. 330–331, Nov. 8, 1895.

Peromyscus bellus Bangs, Proc. Biol. Soc. Wash., X, p. 137, Dec. 28, 1896.—Stilwell, Okla.

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[a] Collection of E. R. Warren.

[b] All approaching *attwateri*.

Peromyscus boylei laceyi **Bailey, N. Am. Fauna No. 25, pp. 99–100, Oct. 24, 1905—Turtle Creek, Kerr County, Tex.**

Peromyscus boylii attwateri **Mearns, Bull. U. S. Nat. Mus. No. 56, p. 423, April 13, 1907.**

Type locality.—Turtle Creek, Kerr County, Tex.

Geographic distribution.—South central and parts of western Texas; north to eastern Oklahoma, central Missouri, and southern Kansas. Chiefly confined to rocky cliffs in upper Sonoran zone.

Characters.—Similar to *rowleyi* but larger (hind foot 22–25); color darker and richer, practically as in *boylei.* Similar to *laceianus* but larger and darker and always with a distinct dusky marking on the tarsal joint; skull and molar teeth smaller.

Color.—Unworn pelage: Almost exactly as in *boylei;* ground color of upperparts pale cinnamon, thoroughly mixed with fine lines of dusky; head, particularly about nose and orbital region, somewhat grayish; dusky orbital ring rather narrow; lower sides of face, axillary region, and narrow lateral line ochraceous buff; dusky of hind leg continued over tarsal joint and encroaching slightly on upper side of hind foot; underparts creamy white, occasionally with an ochraceous buff pectoral spot. Worn pelage: Upperparts varying from cinnamon to russet and pale cinnamon rufous, variously mixed with dusky or brownish.

Skull.—Similar to that of *boylei* and *rowleyi* but larger; braincase higher, more inflated; audital bullæ and molar teeth decidedly larger.

Measurements.—Average of 10 topotypes:[a] Total length, 196 (187–216); tail vertebræ, 100 (96–110); hind foot, 21 (20–23). Hind foot of type (dry), 23.5. Average of 10 adults from Stilwell, Okla.: Total length, 205 (196–218); tail vertebræ, 103 (97–112); hind foot, 24.3 (23–25); ear from notch (dry), 16.2 (15.5–17.2).

Type specimen.—No. $\frac{10401}{8712}$ American Museum of Natural History, New York. ♀ adult. Mar. 12, 1895. H. P. Attwater. Skin in good condition. Skull with zygomata and pterygoids slightly broken; last left upper molar missing.

Remarks.—Although the wide range of the pale form *rowleyi* is interposed between that of typical *boylei* and of *attwateri*, the latter two are very similar. In general, *attwateri* has a somewhat grayer face than *boylei*, and the dusky hairs of the back show more distinctly as lines, but many specimens of each are practically indistinguishable by color alone. The large size and rather rich color of *attwateri* are most developed in the northern part of its range, in the Wichita and Ozark mountains. Specimens from western Texas in the Davis Mountains and vicinity seem referable to *attwateri*, but do not differ greatly from others from Colonia Garcia, Chihuahua, which have been referred to *rowleyi*, and which may be considered as approaching either *attwateri* or *spicilegus*.

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[a] From original description.

It does not seem possible to recognize '*P. bellus*,' for though it may differ by extremely slight average characters from *attwateri* from the type locality, it merely represents the extreme of a differentiation away from *rowleyi* which is well established at the type locality of *attwateri*. The recognition of both *attwateri* and '*bellus*' would therefore make *attwateri* an extremely slight and practically indefinable intermediate between *rowleyi* and '*bellus*.' The name *laceyi* is a pure synonym of *attwateri*, having been based upon the same species from the same locality on the supposition that the name *attwateri* applied to the form of *pectoralis* now called *laceianus*.

Specimens examined.—Total number 273, from localities as follows:

Arkansas: Batesville, 3.

Kansas: Cedarvale, 4.

Oklahoma: Dougherty, 21; Redland, 2; Red Oak, 8; Stilwell, 37; Wichita Mountains (vicinity of Mount Scott and Mount Sheridan), 110.

Texas: Boerne, 4; Chinati Mountains, 4; Davis Mountains, 6; Fort Davis, 10; Ingram, 1; Kerrville, 1; Mason, 30; Paisano, 13; Turtle Creek, Kerr County, 17; Waring, 2.

PEROMYSCUS BOYLEI SPICILEGUS (ALLEN).

(Pl. IV, fig. 3.)

Peromyscus spicilegus Allen, Bull Am. Mus. Nat. Hist., N. Y., IX, pp. 50–51, March 15, 1897.

Type locality.—Mineral San Sebastian, Mascota, Jalisco, Mexico.

Geographic distribution.—Western slopes of the Sierra Madre of Mexico from southern Sonora south to southern Jalisco.

Characters.—Somewhat similar to *rowleyi*, but size larger and color richer; prevailing color rich tawny ochraceous, with blackish ears in strong contrast; skull similar to those of *boylei*, *rowleyi*, etc., but braincase usually more expanded anteriorly forming an incipient supraorbital shelf.

Color.—Unworn pelage: Upperparts rich tawny, sometimes approximating ochraceous rufous; dusky and dusky-tipped hairs uniformly distributed throughout upperparts, but only slightly modifying the predominating tawny, sometimes slightly concentrated on dorsum, forming a poorly defined stripe of blackish; sides like back, lateral line rather broad but not strongly contrasted; a black or nearly black orbital ring slightly extended posteriorly into a grizzled area between the eye and the base of the ear; ears dusky, very narrowly or not at all edged with yellowish white; tufts of partly concealed soft black hairs at the anterior bases of the ears; feet white;

dusky of hind leg extending to and slightly beyond metatarsal joint; underparts creamy white usually with a grayish cast caused by the slaty undercolor; a large tawny pectoral spot frequently present; tail blackish brown above, white below, the rather coarse annulations usually obvious. Worn pelage: More similar to unworn pelage than usual in the genus; upperparts rather duller, more nearly ochraceous buff, with dusky mixture minimized or changed to pale brownish which appears in general effect like fine vermiculation; middle of back often nearly cinnamon. Adolescent pelage: General effect of upperparts nearly sepia with a strong tinge of fawn; lateral line of pale ochraceous buff obvious.

Skull.—Size about as in *boylei;* braincase rather more flattened anteriorly; subraorbital border usually sharp-angled from parietofrontal suture to lachrymal expansion, almost forming a shelf; palatine slits laterally expanded; interpterygoid fossa relatively wide; audital bullæ rather small.

Measurements.—Average of 8 adult topotypes: Total length, 198 (189–210); tail vertebræ, 101, (95–108); hind foot, 23.4 (23–25); ear from notch (dry), 16.3 (15.4–17.3).

Type specimen.—No. $\frac{8373}{6667}$ American Museum of Natural History, New York. ♂ adult. Dec. 2, 1893. Audley C. Buller. Skin in fair condition; feet and tail somewhat twisted; pelage smooth and clean. Skull practically perfect.

Remarks.—*P. b. spicilegus* and its near relatives *levipes, aztecus,* etc., are among the most common of Mexican mice. As members of a group they are quite easily recognizable, although it is rather difficult to formulate a set of characters peculiar to them, and the distinguishing of different forms within the group is extremely perplexing. *P. spicilegus* is fairly well restricted to the mountains of western Mexico, although within this range variations occur that more or less definitely approach *rowleyi, levipes, simulus,* or *evides.* Its bright tawny color, blackish ears, etc., distinguish it from *rowleyi;* its smaller audital bullæ and flattened supraorbital border distinguish it from most specimens of *levipes;* its larger teeth and longer nasals from *simulus;* and its smaller teeth and less extensively dusky hind feet from *evides.* There is much local variation throughout the group, and although the forms mentioned above are fairly well marked, the great majority of specimens examined combine the characters of two or more of them and have been referred to the ones they resemble most closely.

Specimens examined.—Total number 232, from localities as follows:

Chihuahua: Sierra Madre, 65 miles east of Batopilas, 7; Sierra Madre, near Guadalupe y Calvo, 5.

Colima: Hacienda San Antonio, 5.

Durango: Chacala, 10; Coyotes, 12; El Salto, 11; Huasamota, 2.

Jalisco: Ameca, 17; Arroyo de Gabalan, 3; Barranca Ibarra, 6 (approaching *evides*); Bolaños, 10; Estancia Jalisco, 1; Etzatlan, 13; Jacala, 2; La Cienega, 4; La Laguna, 8; La Laja, 3; Mascota, 1; Sal si Puedes, 1; San Sebastian, 23; Sierra de Juanacatlan, 5; Talpa, 3; Wakenakili Mountains, 13.

Sinaloa: Plomosas, 6 (approaching *evides*); Sierra de Choix, 50 miles northeast of Choix, 14.

Sonora: Mountains near Alamos, 18.

Tepic: Jalisco, 2; Pedro Pablo, 1; Santa Teresa, 10 (approaching *simulus*).

Zacatecas: Monte Escobedo, 2; Plateado, 4; Sierra Madre, 10.

PEROMYSCUS BOYLEI SIMULUS Osgood.

(Pl. IV, fig. 4.)

Peromyscus spicilegus simulus Osgood, Proc. Biol. Soc. Wash., XVII, pp. 64–65, Mar. 21, 1904.

Type locality.—San Blas, Tepic, Mexico.

Geographic distribution.—Lowlands of the west coast of Mexico, in Sinaloa and Tepic.

Characters.—Similar to *spicilegus*, but smaller and averaging paler; nasals shorter; teeth much smaller.

Color.—Almost as in *spicilegus*, but averaging slightly paler, as indicated by a few specimens in new pelage that are more nearly ochraceous buff than tawny; tail in some specimens blackish all around, not sharply bicolor; pectoral spot frequently present.

Skull.—Somewhat similar to that of *spicilegus*, but smaller and more angular; nasals and rostral part of skull decidedly shorter; parietal narrower and less shelf like; premaxillæ not exceeding nasals; zygomata relatively heavy and squared anteriorly; molar teeth very small; bony palate short.

Measurements.—Average of three adult topotypes: Total length, 208; tail vertebræ, 111; hind foot, 23; ear from notch (dry), 15.

Type specimen.—No. 88088 U. S. National Museum, Biological Survey Collection. ♂ adult. Apr. 18, 1897. E. W. Nelson. Skin in good condition. Skull with last right upper molar missing; otherwise perfect.

Remarks.—This is a well-marked form, a coast representative of the mountain animal *spicilegus*. Specimens from Rosario and near Mazatlan are in nearly unworn pelage and perhaps represent the extreme of the form, in which the color is somewhat paler than in *spicilegus*. The type of *simulus*, which was selected with particular reference to its cranial characters, is somewhat darker and nearly the same color as *spicilegus*. It may therefore be regarded as slightly intermediate.

Specimens examined.—Total number 45, from localities as follows:

Sinaloa: Escuinapa, 20; near Mazatlan, 6.

Tepic: Navarrete, 3; Rosario, 10; San Blas, 6.

PEROMYSCUS BOYLEI MADRENSIS MERRIAM.

Peromyscus madrensis Merriam, Proc. Biol. Soc. Wash., XII, p. 16, Jan. 27, 1898.

Type locality.—Maria Madre Island, Tres Marias Islands, Mexico.

Geographic distribution.—Confined to the Tres Marias Islands.

Characters.—Similar to *P. b. spicilegus*, but averaging larger and paler; ears averaging slightly smaller.

Color.—Worn pelage: Upperparts chiefly dull ochraceous buff more or less 'peppered' and vermiculated with brownish cinnamon, the latter most abundant in the middle of the back; lateral line rather indefinite, nearly clear ochraceous buff; ears dusky brownish; narrow orbital ring and spot at base of whiskers blackish; underparts creamy or yellowish white, often with a prominent ochraceous buff pectoral spot; feet dull white, tarsal joint dusky; tail very indistinctly bicolor or almost unicolor, in some specimens dusky above and dull whitish below, in others nearly uniform dusky all around except proximally where it is always somewhat paler below.

Skull.—Practically as in *spicilegus*, but averaging quite decidedly larger; skull in general rather more elongate; audital bullæ and molar teeth actually about as in *spicilegus*, relatively smaller.

Measurements.—Average of 12 adult topotypes: Total length, 224; tail vertebræ, 120; hind foot, 26; ear from notch (dry), 15.6 (14.7–17.2).

Type specimen.—No. 89223 U. S. National Museum, Biological Survey Collection. ♂ adult. May 18, 1897. E. W. Nelson and E. A. Goldman. Specimen in good condition.

Remarks.—Although this is a well-marked form, it seems best to treat it, as well as its near relative *spicilegus*, as a subspecies of *boylei*. Individual variation in *madrensis* and *spicilegus* practically covers the difference between them. Skulls from Maria Cleofa and Maria Magdalena are somewhat larger than those from Maria Madre and one might almost consider the Maria Madre ones as intermediates. Certain of the Maria Madre skulls are exactly like skulls of *spicilegus* from the mainland.

The series from the islands are in rather worn pelage, and when compared with unworn specimens of *spicilegus* appear very pale, but are only slightly paler than similarly worn examples of *spicilegus*.

Specimens examined: Total number 18, from localities as follows:

Mexico: Maria Cleofa Island, 3; Maria Madre Island, 14; Maria Magdalena Island, 1.

PEROMYSCUS BOYLEI EVIDES OSGOOD.

Peromyscus spicilegus evides Osgood, Proc. Biol. Soc. Wash., XVII, p. 64, Mar. 21, 1904.

Type locality.—Juquila, Oaxaca, Mexico.

Geographic distribution.—Western Mexico at lower altitudes than *P. b. spicilegus;* known from localities in the States of Guerrero, Oaxaca, and Michoacan.

Characters.—Color as in *spicilegus*, except upper side of hind foot, which usually has a wedge-shaped dusky area extending from the leg across the tarsal joint nearly to the base of the toes; skull and teeth decidedly larger and heavier.

Color.—Upperparts tawny ochraceous slightly mixed with dusky, this slightly or scarcely concentrated medially; a narrow black orbital ring and spot at base of whiskers; underparts creamy white usually with a tawny pectoral spot; tail blackish above, white below; forearm sooty to wrist, hands white; tarsal joint and proximal half of hind foot usually dusky except on sides.

Skull.—Similar to that of *spicilegus* but larger and heavier; supraorbital border, quite shelf like; molar teeth larger and heavier; also similar to that of *aztecus*, but averaging slightly shorter and broader.

Measurements.—Average of 5 topotypes: Total length, 208; tail vertebræ, 111; hind foot, 23; ear from notch (dry), 13.6 (12.6–14.5). Of 10 adults from Los Reyes, Michoacan: 222 (212–230); 112 (105–122); 23.6 (23–25).

Type specimen.—No. 71426 U. S. National Museum, Biological Survey Collection. ♂ yg. adult. Feb. 28, 1895. E. W. Nelson and E. A. Goldman. Specimen in good condition.

Remarks.—This form appears to be the western representative of *aztecus*, from which it differs chiefly in its paler color. Although no unquestionable intergrades between *aztecus* and *evides* are at hand, nor any specimens from intermediate localities, the difference between the two is so slight and so nearly bridged by individual variation, that the existence of intergrades is scarcely to be doubted. Intergrades between *evides* and *spicilegus* have been examined from Plomosas, Sinaloa and Barranca Ibarra, Jalisco, and even from San Sebastian, the type locality of *spicilegus*.

Specimens examined.—Total number 47, from localities as follows:

Guerrero: Omilteme, 11.
Michoacan: Los Reyes, 31.
Oaxaca: Juquila, 5.

PEROMYSCUS BOYLEI LEVIPES (MERRIAM).

(Pl. IV, fig. 2.)

Peromyscus levipes Merriam, Proc. Biol. Soc. Wash., XII, pp. 123–124, Apr. 30, 1898.

Peromyscus beatae Thomas, Ann. & Mag. Nat. Hist., London, Ser. 7, XI, pp. 485–486, May, 1903.—Mount Orizaba, Mexico.

Type locality.—Mount Malinche, Tlaxcala, Mexico.

Geographic distribution.—Eastern and southwestern Mexico and western Guatemala, chiefly in mountainous regions from central Nuevo Leon south through San Luis Potosi, Hidalgo, Veracruz, etc., to southern Oaxaca; reappearing in the highlands of Chiapas and western Guatemala.

Characters.—Similar to *spicilegus*, but somewhat larger and darker colored; dusky mixture in upperparts more copious; pelage usually longer and softer; skull usually broader; supraorbital border not so sharp-angled; audital bullæ larger. Similar to *aztecus*, but color much duller and more dusky.

Color.—Unworn pelage: Ground color of upperparts varying from rich ochraceous buff to tawny always strongly modified by dusky, producing a general effect that varies from russet to Prout brown; sides with tawny rather predominating; lateral line not sharply marked; back with dusky usually predominating, sometimes forming a blackish diffuse stripe, often taking the form of close lines; orbital ring blackish, slightly produced posteriorly toward a grizzled area between the eye and the base of the ear; ears dusky, scarcely edged with whitish; a tuft of soft blackish slate hairs at the anterior base of the ear; underparts creamy white, never thoroughly concealing the slaty undercolor; a pectoral spot sometimes present; feet white, tarsal joint sharply marked with dusky; tail bicolor, brownish dusky above, white below, under side sometimes flecked with dusky. Worn pelage: General effect of sides and upperparts bright cinnamon or ochraceous buff to tawny usually with a darker middorsal area of russet or Prout brown; dusky markings reduced throughout and more brownish than blackish.

Skull.—Quite variable; usually larger, shorter, broader, and with larger audital bullæ and molar teeth than in *spicilegus;* supraorbital border not so sharp-angled and seldom showing much tendency to the development of a shelf; infraorbital notch slight or scarcely evident. Similar to that of *aztecus* but usually shorter and broader; audital bullæ averaging larger; supraorbital border not so sharp-angled.

Measurements.—Type and 1 topotype, respectively: Total length, 200, 184; tail vertebræ, 102, 93; hind foot, 23.5; 22. Two adults from Maltrata, Veracruz: 212, 192; 114, 102; 25, 22. Average of ten adults from Encarnacion, Hidalgo: 208 (198–234); 108 (97–123); 24 (23–25); ear from notch (dry) 16.2 (15.6–16.7). Average of seven adults from Zunil, Guatemala, 212 (204–227); 110 (103–123); 23.9 (23.5–25).

Type specimen.—No. 53673 U. S. National Museum, Biological Survey Collection. ♂ adult, old. May 12, 1893. E. W. Nelson and E. A. Goldman. Specimen in good condition.

Remarks.—This is a common and widely distributed form throughout most of the mountainous parts of eastern, central, and southern Mexico and Guatemala. Although doubtless many mountain colonies are quite isolated, there is comparatively little local variation. Thus, those of the highlands of Chiapas and Guatemala are separated from those of more northern localities by the low and relatively arid region of the Isthmus of Tehuantepec. Yet series from Guatemala do not differ from comparable series from Hidalgo, for example; or if there is any difference between selected specimens it is no greater and is usually less than individual variation in each of the series concerned. Individual variation is relatively great, especially in size and cranial characters. The size of the audital bullæ, while averaging greater than in *spicilegus*, *aztecus*, etc., is extremely variable, and often each specimen of a considerable series from one locality has slightly peculiar bullæ. The size of the molar teeth also varies, and in some cases to such an extent that suspicion arises that two distinct species are being confused. Nevertheless, it does not seem possible to prove this. Color variation runs from specimens as bright as *spicilegus* to others almost as dark as *lepturus*.

Certain individuals in almost every series can scarcely be duplicated elsewhere, and even the type of *levipes* is not exactly like any of several topotypes. Under these circumstances, the only logical course seems to be to unite all of one general type under the name *levipes*. Specimens from Nuevo Leon average rather smaller than usual and show much resemblance to *spicilegus* in color, but they may be exactly matched among specimens from the general vicinity of the type locality. At other localities the average size may be large, but this again is nearly or quite covered by individual variation. '*P. beatae*', described from Mount Orizaba, relatively very near Mount Malinche, is an undoubted synonym, being well within the range of variation ordinarily found in the *boylei* group. Mr. Thomas had no specimens of *levipes* and attempted no comparisons with it at the time he proposed the name *beatae*.

Specimens examined: Total number 402, from localities as follows:

Chiapas: Canjob, 4; Comitan, 16; mountains near Comitan, 3; Valley of Comitan, 18; San Cristobal, 22; Teopisca (20 m. southeast), 6.

Guatemala: Calel, 6; Hacienda Chancol, 21; Todos Santos, 4; Volcan Santa Maria, 13; Zunil, 23.

Guerrero: Ayusinapa, 4 (approaching *spicilegus?*); mountains near Chilpancingo, 38.

Hidalgo: El Chico, 17; Encarnacion, 25; Pinal de Amoles, 10; Real del Monte, 7; Tulancingo, 4.

Jalisco: Ocotlan, 1; Zapotlan, 1.

Mexico: Tlalpam, 1.

Michoacan: Patzcuaro, 1.

Morelos: Cuernavaca, 1; Tetela del Volcan, 3 (aberrant).

Nuevo Leon: Cerro de la Silla, 18; Monterey, 37 (aberrant).

Oaxaca: Cerro San Felipe, 4; Mount Zempoaltepec, 3; mountains west of Oaxaca, 8; mountains near Ozolotepec, 11; Reyes, 20; San Miguel, 5; Tamazulapam, 1.

Puebla: Atlixco, 2; San Martin, 1; Tochimilco, 4 (aberrant).

San Luis Potosi: Villar, 11.

Tlaxcala: Mount Malinche, 4.

Veracruz: Maltrata, 6; Orizaba, 2; Perote, 4; Xometla Camp, Mount Orizaba, 6; Xuchil, 6.

PEROMYSCUS BOYLEI AZTECUS (SAUSSURE).

(Pl. IV, fig. 5.)

Hesperomys aztecus Saussure, Rev. et Mag. de Zool., Paris, XII, pp. 105–106, pl. IX, fig. 4, Mar., 1860.

P[eromyscus] aztecus Thomas, Ann. & Mag. Nat. Hist., ser. 6, XIV, p. 365, Nov., 1894.

Type locality.—Mexico; probably the vicinity of Mirador, Veracruz.

Geographic distribution.—Lower austral zone (and possibly part of humid tropical) of parts of the States of Veracruz and Puebla.

Characters.—Size medium (hind foot 23–26), slightly larger than *levipes*, smaller than *mexicanus* and *oaxacensis;* tail about equal to head and body, rather coarsely hairy and usually decidedly bicolor; ears moderate, very thinly haired; color very rich, chiefly deep tawny; most similar to *P. b. evides* but size slightly larger; ears larger, and color richer; skull with supraorbital border sharp-angled but not definitely beaded.

Color.—Upperparts deep rich tawny with light mixture of blackish on sides and heavier on dorsum forming a poorly defined blackish dorsal area; black orbital ring and spot at base of whiskers sharply defined against tawny cheek; toes and distal part of feet white; front side of forearm tawny and dusky nearly or quite to wrist; outer side of hind leg, tarsal joint, and median proximal half of upper side of hind foot blackish brown; ears dusky without definite pale edgings, a tuft of partly concealed blackish hairs at their anterior bases; tail blackish brown above, white or white lightly sprinkled with brownish below; underparts creamy white, occasionally with a small tawny pectoral spot. Worn pelage: Very similar to unworn pelage but slightly duller and with tawny still more largely predominating over the dusky mixture; dorsum but little different from sides.

Skull.—Size medium; teeth relatively large; braincase rather deep and slightly elongate; interparietal large; supraorbital border sharp-angled, but not beaded; zygomata quite distinctly notched anteriorly; audital bullæ rather small; interpterygoid fossa rather wide and expanded anteriorly. Most like that of *evides*, but slightly larger and more angular; smaller, with relatively larger teeth than in *oaxacensis* or *mexicanus;* braincase narrower, supraorbital border more sharply angled, and audital bullæ smaller than in *levipes*.

Measurements.—Average of 5 adults from Mirador, Veracruz: Total length, 229 (215–238); tail vertebræ, 113 (107–121); hind foot, 24.5 (24–26); ear from notch (dry), 15.2 (14.5–16).

Type specimen.—In the original description (l. c., p. 106, footnote), Saussure stated that he had 3 specimens and naturally at that date he did not specify one of them as the type. At least two of these specimens now exist, one a mounted specimen accompanied by a skull in the Geneva Museum,[a] and the other a skin in rather poor condition in the U. S. National Museum. The figure of the molar teeth published by Saussure doubtless represents the Geneva specimen, since this has the only skull known to have been preserved. Therefore if a type must now be selected, it should be the Geneva specimen. The specimen in the U. S. National Museum (No. 3926) is perhaps of greater value for comparison, as it is a skin and, not having been much exposed to light, shows nearly its original colors. It is slit down the middle of the back and only the head and legs are stuffed with cotton. Some hair is gone from the throat, the left ear is imperfect, and the distal half of the tail absent; otherwise it is well preserved and agrees in every respect with recently collected specimens from Mirador, Veracruz, which, in the lack of exact knowledge, may be assumed to be the type locality, as it is certain that some at least of Saussure's specimens were taken near there.

Remarks.—*P. b. aztecus* is characterized chiefly by its very rich tawny color, and by this may be readily distinguished from most other species of eastern Mexico. *P. oaxacensis* approximates this richness of color, but is considerably larger and occurs at greater elevations. *P. mexicanus* is also larger and has relatively small teeth, less tawny color, and irregularly marked tail. *P. b. levipes* is more nearly the size of *aztecus*, but has smaller teeth, larger audital bullæ, and less tawny color.

It is with some reluctance that *aztecus* is included among the subspecies of *boylei*, but no break in the continuous series of definable forms seems discoverable. From *spicilegus* to *evides* is but a short step, and from *evides* to *aztecus* but another, and each is almost or quite bridged by individual variation. Although *spicilegus* is believed to intergrade with *levipes*, there is no evidence that *aztecus* does so, and it would not be surprising to find both *aztecus* and *levipes* at one locality.

The applicability of Saussure's name to this form is scarcely to be doubted, for even if the specimens still extant are disregarded, the original description is so accurate and complete as to be conclusive. The combination of rich tawny color and the extension of dusky on the hind feet has not been found in any other species of eastern Mexico. Both these characters are emphasized by Saussure, as shown from the following extracts from his description:

> Le pied blanchâtre, avec le premier tiers brun-gris en dessus. * * * souvent aussi le pied postérieur est gris-brun jusqu'aux doigts et mêlé de poils blancs * * * par ses flancs qui sont d'un ferrugineux cannelle ainsi que la face externe des pattes antérieures. Cette couleur est très-prononcée.

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[a] I am indebted to Dr. Merriam for notes and a careful description of this specimen, which was critically examined by him some years ago.

Specimens examined.—Total number 18, from localities as follows:

Puebla: Huachinango, 6.
Veracruz: Jalapa, 2; 'Mexico,' 1; Mirador, 9.

PEROMYSCUS OAXACENSIS Merriam.

(Pl. III, fig. 5.)

Peromyscus oaxacensis Merriam, Proc. Biol. Soc. Wash., XII, p. 122, Apr. 30, 1898.

Type locality.—Cerro San Felipe, Oaxaca, Mexico. Altitude 10,300 feet.

Geographic distribution.—High altitudes in southern Mexico, chiefly in the State of Oaxaca; reappearing in the mountains of central Chiapas.

Characters.—Size rather large (hind foot 25–29); tail decidedly longer than head and body, well haired and evenly bicolor; sole of hind foot, except plantar tubercles, hairy; ears relatively small; color chiefly rich tawny; similar in general characters to *P. b. aztecus*, but larger and longer-tailed; skull heavier.

Color.—Upperparts rich tawny mixed with black; middle of back more blackish, sides and shoulders more tawny; sides of face tawny with scarcely a suggestion of grayish; orbital ring and spot at base of whiskers black; sides of nose buffy; ears very thinly haired, scarcely or not at all edged with whitish; feet white, tarsal joint dusky; underparts creamy white; tail evenly bicolor, blackish above, white below. Worn pelage: General effect of upperparts bright, rich tawny shading to cinnamon rufous in middle of back and but little modified by mixture of dusky. Adolescent pelage: Upperparts mixed pale tawny and dusky, producing a general effect approaching bistre and sepia. Color in all pelages almost exactly as in *P. b. aztecus.*

Skull.—Similar to that of *P. b. aztecus*, but averaging larger and heavier: cheek teeth larger; audital bullæ actually slightly larger, relatively about same size; palatine slits larger; supraorbital border sharp-angled but not beaded; general characters about as in *hylocetes*, but audital bullæ slightly smaller.

Measurements.—Type: Total length 242; tail vertebræ 122; hind foot 27. Average of 6 adults from San Cristobal, Chiapas: Total length 246 (241–260); tail vertebræ 127 (120–135); hind foot 27; ear from notch (dry) 16.7 (15.8–17.5).

Type specimen.—No. 68426 U. S. National Museum, Biological Survey Collection. ♂ adult. Sept. 1, 1894. E. W. Nelson and E. A. Goldman. Specimen in good condition.

Remarks.—Individual variation so nearly bridges the difference between *oaxacensis* and *aztecus* that very little objection could be made if *oaxacensis* were included with *aztecus* as a subspecies of the *boylei* series. In its rich tawny color and all general characters it is closely similar to *aztecus*, differing merely in larger size and longer tail. It inhabits much more elevated regions than *aztecus* and occurs at the same localities with another member of the *boylei* series, *levipes*, from which it may be distinguished both by external and by cranial characters. Possibly here is another example of two subspecies of the same group occurring together, for *levipes* appears to intergrade with *spicilegus*, *spicilegus* with *evides* and *aztecus*, and quite probably *aztecus* with *oaxacensis*. However, until the evidence is more complete, it is perhaps best to consider *oaxacensis* as distinct. In some conditions of pelage, *mexicanus* may show considerable resemblance to *oaxacensis*, but the latter is always distinguishable by its more hairy, sharply and evenly bicolor tail.

Specimens examined.—Total number 69, from localities as follows:

Chiapas: Comitan Valley, 5; Pinabete, 12; San Cristobal, 24.
Oaxaca: Cerro San Felipe, 2; Comaltepec, 1; Oaxaca (15 m. west), 6; Reyes, 19.

PEROMYSCUS HYLOCETES MERRIAM.

(Pl. III, fig. 8.)

Peromyscus hylocetes Merriam, Proc. Biol. Soc. Wash., XII, p. 124, Apr. 30, 1898.

Type locality.—Patzcuaro, Michoacan, Mexico. Altitude 7,000 feet.

Geographic distribution.—Mountainous parts of Michoacan and southern Jalisco; east to mountains near the Valley of Mexico.

Characters.—Size medium; tail rather short, usually shorter than head and body, well clothed with hair and sharply bicolor; color rather dark; most similar to *evides* and *oaxacensis*, but differing from both in relatively shorter tail and larger audital bullæ.

Color.—Unworn pelage: Upperparts pale ochraceous buff, becoming tawny on sides, heavily mixed with blackish, forming a more or less definite blackish dorsal stripe; a narrow lateral line nearly clear tawny, widening somewhat on lower cheeks; nose and postorbital region slightly grayish; orbital ring and spot at base of whiskers sharply blackish; ears thinly clothed with brownish hairs, scarcely or not at all edged with whitish, soft blackish partly concealed hairs at anterior bases; underparts creamy white, usually modified by blackish slate undercolor; feet chiefly white, dusky extending nearly to carpal joint and over tarsal joint sometimes halfway to the end of the hind foot; tail sharply bicolor, blackish above, white below. Worn pelage: General effect of upperparts cinnamon to russet; dorsal stripe not well differentiated, but dark undercolor showing throughout upperparts; lateral line scarcely distinct; otherwise as in unworn pelage.

Skull.—Similar in general form to those of *aztecus* and *oaxacensis;* audital bullæ slightly inflated, larger than in *evides* or *oaxacensis*, but smaller than in *difficilis* or *melanophrys;* palatine slits rather large; interpterygoid fossa somewhat widened anteriorly; no supraorbital bead, but frontals rather wide and supraorbital border decidedly sharp-angled, sometimes forming a slight shelf; nasals rather narrow and depressed anteriorly; premaxillæ somewhat expanded laterally.

Measurements.—Type: Total length, 238; tail vertebræ, 114; hind foot, 25. Average of 6 adults from Mount Tancitaro, Michoacan: Total length, 227 (220-237); tail vertebræ, 113 (106-117); hind foot, 26.1 (25-27); ear from notch (dry), 18 (17.5-18.5).

Type specimen.—No. 50423 U. S. National Museum, Biological Survey Collection. ♂ adult. July 27, 1892. E. W. Nelson and E. A. Goldman. Specimen in good condition.

Remarks.—This species is evidently a member of the *boylei* series, but appears to be distinct, although it approaches *aztecus* and *evides* very closely. Its slightly shorter tail, more blackish color and larger audital bullæ are the chief characters distinguishing it from these forms. It averages somewhat larger throughout and the skull is usually heavier; but there is some variation in size, and skulls are found practically identical with those of *evides*, save that the audital bullæ are slightly larger. It closely resembles *oaxacensis* in color and general characters, but is easily separated from that species by its shorter tail. From *levipes* it is distinguished by its sharp-angled supraorbital border and less abruptly constricted frontals.

Specimens examined.—Total number 74, from localities as follows:

Jalisco: Sierra Nevada de Colima, 13.
Mexico: Amecameca, 3.
Michoacan: Mount Tancitaro, 17; Patamban, 37; Patzcuaro, 3.
Morelos: Huitzilac, 1.

Key to subspecies of Peromyscus pectoralis.

Size larger; hind foot 21–23; tail relatively shorter, averaging less than 100.
    Western Texas and Mexico near the Rio Grande.................. *P. p. laceianus*
Size smaller; hind foot 20–22; tail averaging more than 100. North Central Mexico.
    Size smaller; color paler; no pectoral spot; tarsal joint white, *P. p. eremicoides*
    Size larger; color darker; usually with a buffy pectoral spot; tarsal joint usually with at least a trace of dusky.................. *P. pectoralis.*

PEROMYSCUS PECTORALIS Osgood.

Peromyscus attwateri pectoralis Osgood, Proc. Biol. Soc. Wash., XVII, pp. 59–60, March 21, 1904.

Type locality.—Jalpan, Queretaro, Mexico.

Geographic distribution.—Known from scattered localities in the Sonoran zone of eastern and central Mexico, from central Nuevo

Leon south to Queretaro, and thence west through southern San Luis Potosi and (probably) Guanajuato to eastern Jalisco and southern Zacatecas.

Characters.—Size and proportions about as in *P. eremicus;* color darker and more vinaceous; tail more coarsely annulated and more hairy, sole of hind foot somewhat hairy on proximal third; skull and teeth widely different. Closely similar in general characters to *P. rowleyi* and *P. levipes*, but with relatively longer tail and always distinguishable by smaller size, particularly by smaller skull and molar teeth.

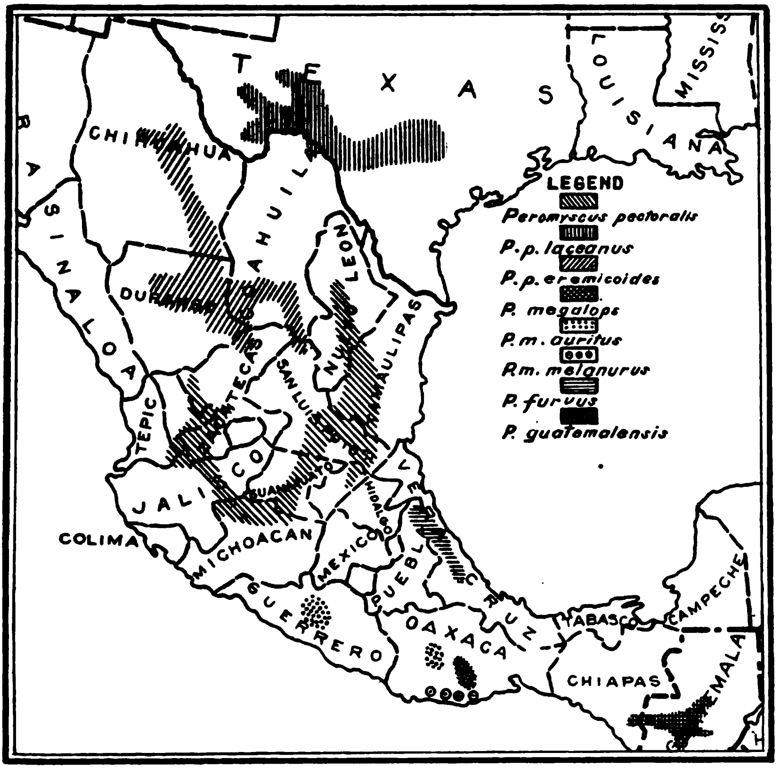

FIG. 5.—Distribution of *Peromyscus pectoralis*, *P. megalops*, *P. furvus*, and *P. guatemalensis*.

Color.—Unworn pelage: Ground color of upperparts pale ochraceous buff, thickly sprinkled with dusky, producing a general effect of dark wood brown; sides of head behind eyes slightly grayish; a narrow dusky orbital ring; underparts white, pectoral region usually strongly buffy ochraceous; ears brownish dusky, narrowly edged with whitish, no markings about base; feet white, tarsal joint usually with little or no extension of dusky from leg; tail variable, dusky brownish above and white or often with a considerable sprinkling of dusky below. Worn pelage: Upperparts pale ochraceous buff, heavily mixed with dusky cinnamon, producing an effect of pale russet; sides of head usually showing more grayish than in unworn pelage; otherwise not peculiar.

Skull.—Most similar to that of *rowleyi*, but smaller throughout: rostrum relatively somewhat broader and heavier; braincase less vaulted; molar teeth decidedly smaller. Somewhat similar to that of *levipes*, but smaller; lacrymal region less swollen; premaxillæ usually ending slightly beyond the even nasals; interparietal relatively large.

Measurements.—Type: Total length, 210; tail vertebræ, 114; hind foot, 22. Average of 10 adults from Villar, San Luis Potosi: 201 (195–209); 110.7 (102–115); 21 (20–22); ear from notch (dry), 15.5 (15.4–17.2).

Type specimen.—No. 81236 U. S. National Museum, Biological Survey Collection. ♂ adult. Aug. 30, 1896. E. W. Nelson and E. A. Goldman. Specimen in good condition.

Remarks.—This is the representative of a small group of subspecies any of which in certain pelages shows considerable superficial resemblance to *P. eremicus* or some of its forms. That none of them are closely related to *eremicus* is easily demonstrated by a comparison of the molar teeth. They are really nearest to *P. boylei* and its subspecies, from which they may be distinguished by smaller size, relatively longer tails, and certain cranial characters. The absence of dusky markings on the tarsal joint, which is characteristic of the other forms *eremicoides* and *laceianus*, is not absolutely constant in *pectoralis*. The majority of specimens, however, show no trace of such marking. The name *pectoralis* is by accident the first one applied to a member of this group, having been cited as a subspecies of *attwateri*, the type of which proved to be another species.[a] The form *pectoralis*, as its name implies, is characterized by the presence of a buffy pectoral spot. When this is absent or not well developed, as is sometimes the case, the form may be distinguished from *eremicoides* and *laceianus* by its darker color.

Specimens examined.—Total number 62, from localities as follows:

Jalisco: Atemajac, 2; Barranca Ibarra, 1; Bolanos, 1; Colotlan, 1.
Nuevo Leon: Cerro de la Silla, 2; Monterey, 10.
Queretaro: Jalpan, 5.
San Luis Potosi: Jesus Maria, 1; Villar, 10.
Tamaulipas: Victoria, 26.
Zacatecas: Hacienda San Juan Capistrano, 2; Monte Escobedo, 1.

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[a] Cf. Bailey, Proc. Biol. Soc. Wash., XIX, pp. 57–58, 1906.

PEROMYSCUS PECTORALIS EREMICOIDES Osgood.

(Pl. IV, fig. 7.)

Peromyscus attwateri eremicoides Osgood, Proc. Biol. Soc. Wash., XVII, p. 60, March 21, 1904.

Type locality.—Mapimi, Durango, Mexico.

Geographic distribution.—North central Mexico, chiefly in the States of Durango, Coahuila, and Chihuahua; north to southern Arizona.

Characters.—Similar to *P. pectoralis*, but smaller and paler; color nearly as in *P. p. laceianus* and often much as in *P. eremicus;* ears quite small; skull small and light; audital bullæ very small; soles of hind feet usually slightly hairy proximally but sometimes naked, at least medially.

Color.—Upperparts mixed pinkish buff and dusky, producing the general effect of pale broccoli brown; lateral line pinkish buff; facial region between eye and ear grayish; underparts pure creamy white without trace of pectoral spot; feet white, no dusky marking on tarsal joint; tail pale grayish dusky above, white below.

Skull.—Similar to that of *pectoralis* but decidedly smaller; audital bullæ very small; nasals short and only slightly or not at all exceeded by the ascending branches of the premaxillæ; rostrum slightly depressed; interorbital constriction relatively wide.

Measurements.—Type and one topotype: Total length, 180, 195; tail vertebræ, 102, 111; hind foot, 20, 21; ear from notch (dry), 14.3, 16.6.

Type specimen.—No. 57729 U. S. National Museum, Biological Survey Collection. ♂ adult. Dec. 15, 1893. E. A. Goldman. Specimen in good condition.

Remarks.—This form is readily distinguishable from *pectoralis* by its small size, paler color, and pure white underparts. From *laceianus* it differs chiefly in smaller size. Its resemblance to *eremicus*, particularly when in worn or immature pelage, is remarkable. The external characters distinguishing it from *eremicus* are smaller ears, slightly more hairy tail, and white tarsal joints. But these are sometimes difficult to appreciate, as the tail in *eremicus* is often quite hairy, and the dusky on the tarsal joint sometimes so little developed as to be scarcely apparent. However, the molar enamel pattern, except in extremely worn teeth, is always diagnostic, *eremicoides* having the small accessory cusps and *eremicus* being without them. Specimens from the type locality of *eremicoides* and a few neighboring localities are well characterized by their small size, but many from outlying localities, though referable to *eremicoides*, are larger and approach *laceianus* or *pectoralis*. Three specimens from Fort Huachuca, Ariz., seem indistinguishable from typical *eremicoides*. Further material from this region is much needed.

Specimens examined.—Total number 56, from localities as follows:

Arizona: Fort Huachuca, 3.
Chihuahua: Chihuahua, 3; Santa Eulalia, 8.
Coahuila: Carneros, 3; Jaral, 2; Jimulco, 4; Saltillo, 10; Sierra Encarnacion, 1.
Durango: Inde, 6; Mapimi, 2.
Nuevo Leon: Santa Catarina, 9.
Tamaulipas: Jaumave Valley, 2 (aberrant); Miquihuana, 3.

PEROMYSCUS PECTORALIS LACEIANUS BAILEY.

Peromyscus attwateri Bailey, N. Am. Fauna No. 25, p. 100, 1905—not of Allen.
Peromyscus pectoralis laceianus Bailey, Proc. Biol. Soc. Wash., XIX, pp. 57–58, May 1, 1906.

Type locality.—Lacey Ranch, near Kerrville, Tex.

Geographic distribution.—West central Texas, from the vicinity of Austin to the Big Bend of the Rio Grande and immediately adjacent parts of Mexico.

Characters.—Similar to *P. p. eremicoides*, but larger and with tail relatively shorter; somewhat similar to *P. b. attwateri* but smaller; color more grayish; feet and tarsal joint white without dusky marking; skull and teeth smaller.

Color.—Unworn pelage: Similar to *eremicoides*, but slightly more vinaceous; ground color of upperparts pinkish buff with a variable mixture of dusky, not especially concentrated on dorsum but quite evenly distributed; general effect varying from broccoli brown to wood brown; underparts creamy white; no white at bases of ears: feet white, tarsal joint not marked with dusky; tail pale brown above, white below. Worn pelage: Dusky of upperparts paler and less extensive; predominating color pale ochraceous buff to pinkish buff or dusky so changed to cinnamon brown shades that the general effect of the upperparts is a peculiar shade variously approaching the écru drab, cinnamon, and fawn of Ridgway.

Skull.—Similar to that of *pectoralis;* decidedly larger than that of *eremicoides;* rostrum averaging slightly heavier than in either. Somewhat like that of *attwateri* but decidedly smaller; molar teeth smaller and weaker; braincase relatively more elongate; interparietal relatively larger.

Measurements.—Type: Total length, 185; tail vertebræ, 95; hind foot, 23. Average of 6 topotypes: 187 (185–192); 96 (94–100); 22.1 (22–23); ear from notch (dry), 15.8 (15–16.2).

Type specimen.—No. 97063 U. S. National Museum, Biological Survey Collection. ♂ young adult. May 3, 1899. V. Bailey. Specimen in good condition.

Remarks.—Of the numerous forms occurring in Texas, this one is apt to be confused with *eremicus* and *attwateri* only. Dental characters readily eliminate *eremicus*, and the presence of dusky markings on the tarsal joints of *attwateri* suffices to remove it from consideration. At first sight *laceianus* conveys the impression of a rather pale grayish individual of *attwateri* or *rowleyi*, and its skull is sufficiently similar to make it quite certain that its nearest affinity is with the *boylei* group. It occurs at the same localities with *attwateri* and, like that form, inhabits rocky situations. Slight confusion of names has resulted through a misapplication of the name *attwateri* (Bailey *l. c.*), but this is now cleared up, and *laceianus* appears to be the only name that has been properly applied to this form.

Specimens examined.—Total number 150, from localities as follows:

Coahuila: Opposite Langtry, Tex., 9; 15 m. southeast of Langtry, Tex., 1; Head of Las Vacas Creek, 1; 15 m. east of Las Vacas, 1.

Texas: Austin, 13; Boerne, 5; Near Camp Verde, 5; Chisos Mountains, 4; Comstock, 6; Davis Mountains, 1; Fort Clark, 4; Llano, 4; Mouth of Devils River, 2; Fort Lancaster, 5; Howard Springs, 2; Ingram, 20; Japonica, 9; Near Juno, 2; Kerr County, 24 (Lacey Ranch 8, Turtle Creek 16); Langtry, 13; Marathon, 1; Mason, 6; East Painted Cave, 1; Pecos River, 55 m. northwest of Comstock, 1; Rock Springs, 1; Samuels, 2; San Antonio, 1; Sanderson, 1; Sheffield, 5.

Key to subspecies of Peromyscus truei.

a. Habitat western United States.
  1. Color paler, largely ochraceous buff; ears averaging larger. Chiefly south and east of the summit of the Sierra-Cascade Range .... *P. truei*
  2. Color darker, largely deep ochraceous, tawny, cinnamon, or russet, often with much dusky mixture; ears averaging smaller. California and Oregon, chiefly west of the summit of the Sierra-Cascade Range .... *P. t. gilberti*

aa. Habitat Mexico.
  b. Habitat Lower California.
    1. Size larger. Northern .... *P. t. martirensis*
    2. Size smaller. Southern .... *P. t. lagunae*
  bb. Habitat Mexico (except Lower California).
    c. Tail shorter, averaging less than 100; ears slightly larger; color pale. Northern .... *P. truei*
    cc. Tail longer, averaging about 110; ears slightly smaller. Central and southern.
      1. Darker .... *P. t. gratus*
      2. Paler .... *P. t. gentilis*

PEROMYSCUS TRUEI (SHUFELDT).

(Pl. IV, fig. 6; Pl. VII, fig. 10.)

Hesperomys truei Shufeldt, Proc. U. S. Nat. Mus., VIII, pp. 407–408, pl. XXI, Sept. 14, 1885.

Hesperomys megalotis Merriam, N. Am. Fauna No. 3, pp. 63–64, pls. III–IV, figs. 1–4, Sept. 11, 1890.—Black Tank, Little Colorado Desert, Arizona.

P[***eromyscus***] ***truei*** Thomas, Ann. & Mag. Nat. Hist., ser. 6, XIV, p. 365, Nov., 1894.

Peromyscus lasius Elliot, Field Col. Mus., Chicago, Zool. Ser., III, pp. 265–266, Mar. 8, 1904.—Hannopee Canyon, Panamint Mountains, California.

Peromyscus montipinoris Elliot, *supra cit.*, III, pp. 264–265, Mar. 8, 1904.—Lockwood Valley, Mount Pinos, California.

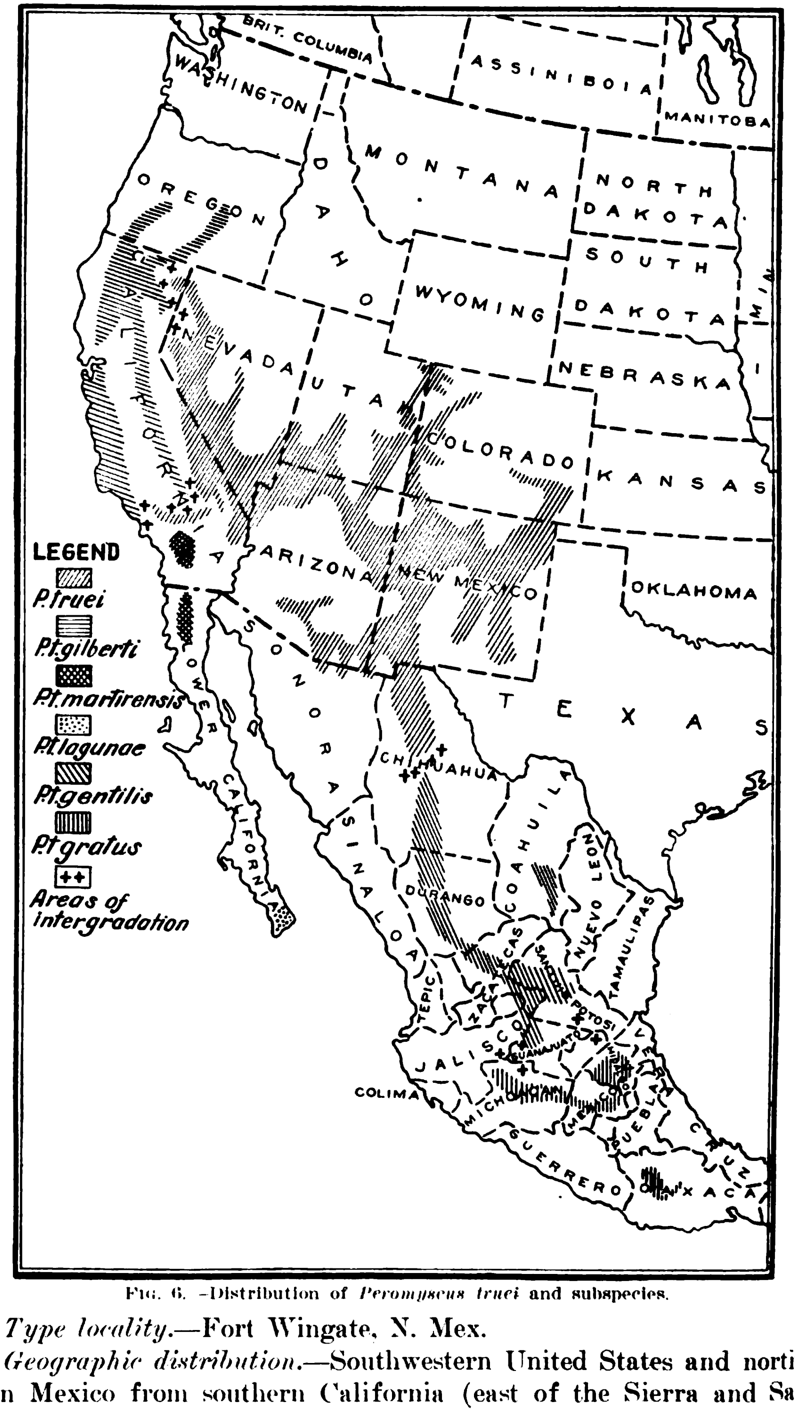

FIG. 6.—Distribution of *Peromyscus truei* and subspecies.

Type locality.—Fort Wingate, N. Mex.

Geographic distribution.—Southwestern United States and northern Mexico from southern California (east of the Sierra and San

Bernardino ranges), across southern Nevada, southern Utah, Arizona, to west central New Mexico, and thence south in Mexico at least to north central Chihuahua.

Characters.—Size medium; tail usually about equal to head and body (often slightly shorter, occasionally slightly longer); pelage quite long, lax, and silky; ears very large, about equal in length to hind foot; hind foot usually densely haired from calcaneum to proximal plantar tubercle (about proximal two-fifths of foot). Similar to *P. b. rowleyi* but ears larger, pelage usually longer and softer, tail more closely haired, annulations finer and more nearly concealed; skull with audital bullæ larger and more orbicular. Similar to *P. nasutus* but size smaller, color brighter, less grayish; ears slightly larger; skull usually smaller throughout; audital bullæ actually and relatively larger.

Color.—Unworn pelage: Ground color of upperparts ochraceous buff mixed on back and sides with fine dusky lines, the general effect variously approaching wood brown, isabella color, and cinnamon; lateral line usually well defined, pure ochraceous buff without dusky mixture; sides of face and nose somewhat grayish; a narrow dusky orbital ring and slight dusky spot at base of whiskers; ears dusky brownish thinly clothed within and without with short grayish white hairs; tufts at anterior bases of ears practically same color as surrounding parts and without any definite white or black; underparts creamy white; feet white, tarsal joint slightly dusky, this often partly concealed by overlying white hairs; tail slightly bicolor, brownish dusky above, white below. Worn pelage: General effect of upperparts pale ochraceous buff to pinkish buff mixed with pale cinnamon so blended as to modify the general color but little; lateral line scarcely distinct from upper sides; otherwise practically as in unworn pelage. Adolescent pelage: Upperparts dull buff strongly mixed with fine dusky lines, producing a general effect of broccoli brown lightly tinged with buff; lateral line pale ochraceous buff, narrow but well-defined; head and face except lower cheeks quite decidedly more grayish than rest of upperparts.[a] Young in first coat: Upperparts pale drab gray overcast with dusky particularly on dorsum.

Skull.—Size medium (greatest length 26–30); braincase rather deep and somewhat vaulted; zygomata somewhat heavy and squared anteriorly, deeply notched by infraorbital foramen; nasals rather broad and flat, abruptly cuneate posteriorly; audital bullæ large and orbicular; interpterygoid fossa nearly right-angled, the anterior angles slightly rounded and indenting palatal shelf. Compared with that of *rowleyi*, the skull of *truei* shows many differences, but the most obvious and diagnostic is the size of the audital bullæ, which is nearly double that of *rowleyi*. Compared with that of *nasutus*, the skull of *truei* is slightly smaller; braincase narrower and deeper; zygomata heavier, more angular anteriorly, and more deeply notched by infraorbital foramen; rostrum and nasals shorter; audital bullæ always relatively and usually actually larger.

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[a] This is usually caused by the persistence of the preceding pelage for a longer period on these parts than elsewhere.

Measurements.—Average of 10 adult topotypes: Total length, 186 (180–195); tail vertebræ, 92 (86–102); hind foot, 23; ear from notch (dry), 22.4 (21.5–24). Of 10 adults from the Manzano Mountains, New Mexico: 197 (180–210); 98 (90–106); 22.5 (22–23). Of 10 adults from the Panamint Mountains, California: 198 (189–210); 103 (97–112); 23.7 (23–24.5).

Type specimen.—No. $\frac{14954}{35108}$ U. S. National Museum. ♂ adult (old). Mar. 14, 1885. R. W. Shufeldt. Skin rather poorly formed: pelage clean, long, and full; right foreleg and left hind leg missing. Skull in good condition; teeth, including incisors, very much worn; zygomata slightly broken; angular process of left ramus of mandible broken; the following teeth missing: right $\underline{m}$ 2, $\underline{m}$ 3; right $\overline{m}$ 2, $\overline{m}$ 3; left m 3; skull otherwise perfect.

Remarks.—This species is common throughout its range and is represented in most collections by at least a few specimens. It is often called big-eared mouse, leaf-eared mouse, and similar names, on account of its unusually large external ears. These are relatively larger than in any other species found north of Mexico, but they vary somewhat in size and may be approximated in forms like *nasutus* and *rowleyi*. Fortunately, however, the large internal audital bullæ of *truei* are as characteristic as the large external ears, and the possession of both is usually diagnostic of any given specimen. Fully adult specimens of *truei* in good pelage are readily recognizable, for the combination of large ears, large orbicular audital bullæ, finely haired tail, and long, soft, and chiefly ochraceous pelage is not found in any other species. But, as is often true, immature specimens, or those in unusual or poor conditions of pelage, may prove difficult to place.

The several subspecies of *truei* preserve most of its general characters fairly well, and differ from it chiefly in size, length of tail, or shade of color, combined with slight cranial peculiarities. Intergradation with *gilberti*, *martirensis*, and *gratus* occurs beyond any reasonable doubt.

There are three synonyms, *megalotis*, which appears to be exactly equivalent to *truei*, and *lasius* and *montipinoris*, which may be regarded as approaching *gilberti*, for though they retain the coloration of *truei* (even in its extreme phases) they differ in slight cranial characters that are practically the same as those of *gilberti*.

Specimens examined.—Total number 475, from localities as follows:

Arizona: Black Tank, Painted Desert, 2; Grand Canyon (top), 1; Holbrook, 10; Keam Canyon, 9; Moccasin Spring, 3; Springerville, 32; Walnut, 4.

California: Coleville, Mono County, 6; Coso, 1; Fort Tejon, 3; Inyo Mountains, 12; Kernville, 2; 25 miles above Kernville, 1; South Fork Kern River, 1; Lone Pine, 1; Long Valley, Mono County, 1; Millford, 1; near Morongo Valley, 3; Mojave, 9; New York Mountain, 3; Panamint Mountains, 46; Piute Mountains, 2; Providence Mountains, 9; San Emigdio Canyon, 1 (approaching *gilberti*); Susanville, 2; Tehachapi Peak, 4 (approaching *gilberti*); Walker Pass, 6; White Mountains, 2.

Chihuahua: Casas Grandes, 2; Colonia Garcia, 7.

Colorado: Ashbaugh Ranch, 3; Coventry, 5; De Beque, 1; Escalante Hills, 3; Gaume Ranch, 2; Glenwood Springs, 1; Lily, 2; McCoy, 1; Plateau Creek, 2; Rangeley, 2; Rinehart Station (20 miles south of Lamar), 1; Rifle, 1; Salida, 1;[a] Uncompahgre Plateau, 1.

Nevada: Anderson Ranch, Douglas County, 16; Charleston Mountains, 8; Gardnerville, 5; Grapevine Mountains, 2; Panaca, 1; Reese River, 1; mountains 16 miles east of Stillwater, 2.

New Mexico: Abiquiu, 1; Ancho, 1; Aztec, 3; Burro Mountains, 2; Capitan Mountains, 34; Cienequilla, 2; Cloudcroft, 1; Corona, 6; Cuervo, 3; Dog Spring, 1; Datil Mountains, 7; Espanola, 1; Fort Wingate, 26; Gallina Mountains, 5; Gallup, 4; Gila National Forest, 3; Glenwood, 1; Grants, 1; Hale Ranch, near Ruidoso, 5; Isleta, 4; Jamez, 1; Jicarilla Mountains, 36; Laguna, 2; La Plata, 5; Manzano Mountains, 20; Mesa Jumanes, 1; Pecos, 3; Ribera, 3; Rinconada, 8; San Andres Mountains, 4; Sandia Mountains, 4; Santa Rosa, 16; Sierra Grande, 3; Silver City, 4; Weed, 1.

Utah: Beaver River, near Fort Cameron, 3; Browns Park, 1; Henry Mountains (east slope Mount Ellen), 1; St. George, 1.

PEROMYSCUS TRUEI GILBERTI Allen.

Sitomys gilberti Allen, Bull. Am. Mus. Nat. Hist., N. Y., V, pp. 188–189, Aug. 18, 1893.

Peromyscus gilberti Allen, *supra cit.*, VIII, p. 267, Dec. 4, 1896.

Peromyscus dyselius Elliot, Field Col. Mus., Chicago, Zool. Ser., I, pp. 207–208, Mar., 1898.—Portola, San Mateo County, Calif.

Type locality.—Bear Valley, San Benito County, Calif.

Geographic distribution.—Mountains and foothills of the interior of California and the coast south of San Francisco Bay; north to central Oregon. Chiefly Upper Sonoran zone.

Characters.—Similar in general to *P. truei*, but color darker and richer; ears and audital bullæ averaging slightly smaller; pelage usually not so long and silky. Somewhat similar to *P. boylei*, but ears and audital bullæ smaller.

Color.—Unworn pelage: Similar to that of *truei*, but darker and richer, ground color a deeper shade of ochraceous, often nearly tawny, dusky mixture more copious; general effect often approaching cinnamon and russet; lateral line usually well-defined, ochraceous to tawny; orbital ring more blackish and more sharply defined than in *truei;* dusky markings intensified throughout; pectoral spot frequently present.

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[a] Collection of E. R. Warren.

Skull.—Similar to that of *truei*, but averaging slightly smaller with slightly smaller audital bullæ; zygomata somewhat lighter anteriorly and not so deeply notched by infraorbital foramen. Somewhat similar to that of *P. boylei*, but audital bullæ decidedly larger and more nearly orbicular.

Measurements.—Average of 5 adults from Gilroy, Calif.: Total length 200 (186–206); tail vertebræ 98 (87–103); hind foot 22.5 (22–24); ear from notch (dry) 19.2 (18–21).

Type specimen.—No. 329 Collection of Stanford University. ♂ adult. Apr. 1, 1893. C. H. Gilbert and W. W. Price. Specimen in good condition.

Remarks.—This form differs from *truei* in much the same way that *boylei* differs from *rowleyi.* It is perhaps more difficult to distinguish from *boylei* than *truei* is from *rowleyi.* Its external ears are somewhat smaller than those of *truei* and therefore approach more closely the size of those of *boylei.* The color is in many cases practically indistinguishable from that of *boylei.* The ears average considerably larger than in *boylei*, but the only certain means of distinguishing specimens of all ages and pelages is in the skulls, in which the audital bullæ are large and rounded in *gilberti* and decidedly smaller and more nearly triangular in outline in *boylei.* The close resemblance of these forms in size, proportions, and color has led to some confusion, for the excellent cranial characters that distinguish them have not always been appreciated. Quite recently one author[a] has stated in very positive terms that *boylei* and *gilberti* are absolutely alike, a conclusion doubtless formed without reference to cranial characters. The *truei* and *boylei* groups seem to be everywhere distinguishable by certain general characters which are still present, but less pronounced and therefore sometimes overlooked, in the representative forms found in central and western California. The extreme of dark color is found in specimens from the heavily forested Santa Cruz Mountains, but specimens nearly or quite as dark are found practically at the type locality of *gilberti* and at other localities somewhat removed from the coast. The name *dyselius* has been given to this extreme, but since *gilberti* is an earlier name and applicable to the darker form as opposed to the paler form *truei*, it does not seem advisable to recognize *dyselius*, for if it were done, *gilberti* would be left as an indefinable intermediate between *truei* and *dyselius* with a decided leaning toward the latter. It would have been fortunate if the extreme of the dark form had received a name earlier.

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[a] Elliot, Field Col. Mus., Zool. Ser., I, pp. 207–208, March, 1898.

Specimens examined.—Total number 493, from localities as follows:

California: Alameda Creek, Santa Clara County, 4; Alum Rock Park, near Mount Hamilton, 26; Middle Fork American River, near Auburn, 2; Baird, 2; Bartlett Springs, 1; Bear Gulch, Alameda County, 2; Bear Valley, San Benito County, 15; Berger Creek, 1; Berkeley, 10; Beswick, 8; Big Basin, Santa Cruz County, 1; Big Pine Mountain, 1; Boulder Creek, 8; Briceland, 1; Calabasas, 2; Calistoga, 4; Camp Meeker, 2; Carbondale, 3; Chico, 2; Coarsegold, 8; Cold Creek, 3; Cone Peak, 1; Coulterville, 1; Edgewood, 3; Eel River, near South Yolla Bolly Mountain, 1; Eshom Valley, Tulare County, 1; Fall River Valley, 3 (approaching *truei*); Fremont Peak, Gabilan Range, 1; Freshwater Creek, 3; Fresno Flat, 2; Gasquet, 2; Gaviota Pass, 1; near Gilroy, 9; Guenoc, 1; Hoopa Valley, 7; Hornbrook, 1; Hurleton, 8; Jolon, 3; East Fork Kaweah River, 2; King City, 1; Laguna Ranch, 3; La Honda, 6; La Panza, 1; Learly Ranch, Mendocino County, 9; near Lower Lake, 32; Marysville Buttes, 41; Monterey, 6; Montgomery, 3; Mount Hamilton, 30; Mount St. Helena, 26; Mount Sanhedrin, 13; Nelson (8 mi. E.), 6; Nicasio, 3; Oakland, 3; Pacheco Pass, 1; Pacheco Peak, 4; Palo Alto, 5; Paraiso Springs, 2; Paso Robles, 5; Pescadero Creek, Santa Cruz Mountains, 13; Picard, 1; Pleyto, 3; Portola, 29; Posts, 2; Pozo, 1; Quincy, 1; Raymond, 3; Redding, 2; Round Valley, 2; Salt Springs, Fresno River, 1; San Antonio, 43; San Lorenzo Creek, 2; near San Simeon, 1; top of Santa Cruz Mountains, near Santa Cruz, 1; Santa Lucia Peak, 3; near Santa Rosa, 1; Scott Valley, 2; Sherwoods, 5; Tassajara Creek, 4; Tracy, 1; Ukiah, 2; Willits, 6; Woodside, 1.

Oregon: Crooked River, 25 miles southeast of Prineville, 2 (approaching *truei?*); Grants Pass, Rogue River Valley, 6.

PEROMYSCUS TRUEI MARTIRENSIS (ALLEN).

Sitomys martirensis Allen, Bull. Am. Mus. Nat. Hist., N. Y., V, pp. 187–188, Aug. 18, 1893.

[*Peromyscus*] *martirensis* Trouessart, Catal. Mamm., p. 516, 1897.

Peromyscus hemionotis Elliot, Field Col. Mus., Chicago, Zool. Ser., III, p. 157, April, 1903.—Rosarito Divide, San Pedro Martir Mountains, Lower California.

Type locality.—San Pedro Martir Mountains, at 7,000 feet altitude, Lower California, Mexico.

Geographic distribution.—San Pedro Martir and adjacent ranges of mountains of northern Lower California, and northward to the San Jacinto and San Bernardino mountains of southwestern California.

Characters.—Color and general characters practically as in *truei;* tail considerably longer; audital bullæ averaging slightly smaller.

Color.—Practically as in *truei;* June and July specimens in slightly worn pelage are chiefly ochraceous buff: the dusky markings on the tarsal joints are much reduced and scarcely obvious.

Skull.—Similar to that of *truei;* zygomata slightly more compressed anteriorly; audital bullæ averaging slightly smaller, but still much larger than in *rowleyi* or *boylei.*

Measurements.—Average of 6 adults from La Grulla, San Pedro Martir Mountains: Total length 213 (205–222); tail vertebræ 116.5 (112–122); hind foot 24; ear from notch (dry) 21.7 (21–23).

Type specimen.—No. $\frac{6315}{4946}$ American Museum of Natural History, New York. May 8, 1893. A. W. Anthony. Skin in good condition. Skull with last right $\underline{m}$ missing; parietal depressed on one side, evidently from injury in life, giving the orbit a slightly beaded effect.

Remarks.—The long tail of this form is its chief distinguishing character. Specimens in all pelages are not yet available, but judging from June and July material, no color difference separates it from typical *truei.* The type and nearly all other specimens examined are in a very bright ochraceous buff pelage exactly like comparable specimens of *truei.* Certain slight cranial characters, though not present in every specimen, seem to have a value as average differences.

Specimens examined.—Total number 90, from localities as follows:

California: San Bernardino Mountains, 8; San Jacinto Mountains, 2; Summit Coast Range, San Diego County, 1.

Lower California: Aguaje de las Fresas, 2; Agua Escondido, 4; El Rayo, Hanson Laguna Mountains, 2; Hanson Laguna, Hanson Laguna Mountains, 17; La Grulla, San Pedro Martir Mountains, 13; Piñon, west slope San Pedro Martir Mountains, 11; Rosarito Divide, 1; San Matias Spring, 1; San Pedro Martir Mountains at 7,000 feet altitude, 4; Santa Eulalia, 9; Santa Rosa, 7; Vallecitos, 8.

PEROMYSCUS TRUEI LAGUNAE subsp. nov.

Type from La Laguna, Laguna Mountains, Lower California, Mexico. No. 147004 U. S. National Museum, Biological Survey Collection. ♀ adult. Jan. 26, 1906. E. W. Nelson and E. A. Goldman.

Geographic distribution.—Mountains of the region of the extremity of the peninsula of Lower California, Mexico.

Characters.—General characters as in *truei;* ears smaller; tail relatively longer: skull smaller and lighter.

Color.—Essentially as in *truei.* Underparts ochraceous buff mixed with fine lines of dusky: nose and postorbital region grayish; a narrow dusky orbital ring: feet white, tarsal joint dusky; tail brownish dusky above, white below; underparts creamy white.

Skull.—Much as in *truei* and *martirensis* but smaller and lighter: rostrum and nasals more slender; zygomata more compressed anteriorly; molar teeth and audital bullæ smaller; interparietal relatively large.

Measurements.—Average of 10 adult topotypes: Total length 193 (182–210); tail vertebræ 105 (97–118); hind foot 22.4 (21.5–23); ear from notch (dry) 19 (18–19.8).

Remarks.—This form, though not strongly characterized, is geographically isolated and the recognition of its peculiarities, such as they are, seems inevitable. During the recent exploration of the peninsula of Lower California by Nelson and Goldman, no specimens of the *truei* group were found in the long stretch of country between the San Pedro Martir Mountains and the Laguna Mountains. Nevertheless, the isolated form here named *lagunae* differs from *martirensis* only in its slightly smaller size and more slender rostrum.

Specimens examined.—Total number 48, from localities as follows:

Lower California: El Sauz, 1; La Chuparosa, 8; La Laguna, 14; Mount Miraflores, 5; Sierra Laguna, 15; Victoria Mountains, 5.

PEROMYSCUS TRUEI GRATUS Merriam.

(Pl. IV, fig. 9.)

Peromyscus gratus Merriam, Proc. Biol. Soc. Wash., XII, p. 123, Apr. 30, 1898.

Peromyscus sagax Elliot, Field Col. Mus., Chicago, Zool. Ser., III, p. 142, Mar., 1903.—Patzcuaro, Michoacan, Mexico.

Peromyscus pavidus Elliot, *supra cit.*, pp. 142–143.—Patzcuaro, Michoacan, Mexico.

Peromyscus zelotes Osgood, Proc. Biol. Soc. Wash., XVII, pp. 67–68, Mar. 21, 1904.—Querendaro, Michoacan, Mexico.

Type locality.—Tlalpam, Valley of Mexico, Mexico.

Geographic distribution.—South central Mexico, in the States of Hidalgo, Mexico, Michoacan, and Queretaro; possibly south to central Oaxaca.

Characters.—Similar in general to *P. truei;* ears somewhat smaller; tail decidedly longer and rather more coarsely haired; color darker, with greater mixture of dusky; skull with shorter and relatively heavier rostrum.

Color.—Unworn pelage: Ground color of upperparts ochraceous to ochraceous buff, heavily and nearly uniformly mixed with blackish; general effect isabella color to nearly sepia; facial region, nose, forehead, etc., more grayish; lateral line nearly clear ochraceous, rather narrow but strongly contrasted; orbital ring sharp blackish; ears brownish dusky edged with whitish; feet white, tarsal joint marked with extension of dusky from hind leg; underparts creamy white, occasionally with a buffy pectoral spot; tail blackish above, white sometimes flecked with blackish below. Worn pelage:

General effect varying through brownish fawn, wood brown, and cinnamon to russet; middle of back usually distinctly darker than sides; lateral line blending more or less perfectly with sides; orbital ring and grayish postorbital region more contrasted than in unworn pelage; otherwise similar to unworn pelage.

Skull.—General form as in *truei;* skull somewhat more compact and heavier; rostrum relatively shorter, broader, and heavier; braincase full and high; nasals broad and often nearly flat; ascending branches of premaxillæ even with, or slightly exceeding, posterior nasal endings; audital bullæ large and full, but relatively smaller than in *truei.*

Measurements.—Average of 10 adult topotypes: Total length, 204 (191–225); tail vertebræ, 110.5 (103–125); hind foot, 22.8 (22–24); ear from notch (dry), 19 (17.5–20.2).

Type specimen.—No. 50619 U. S. National Museum, Biological Survey Collection. ♀ adult. Nov. 30, 1892. E. W. Nelson and E. A. Goldman. Specimen practically perfect.

Remarks.—This is merely a longer-tailed and darker edition of *truei* with which intergradation occurs in north central Mexico. It is somewhat variable in cranial characters, but the nasals generally are broad, nearly flat, and rather short. Specimens from Michoacan as a rule have rather narrower nasals and large palatine foramina, but the variation is such that it seems inadvisable to recognize another form from this region. *P. gratus* is distinguishable from *levipes, spicilegus,* etc., which are nearly the same size, by its large audital bullæ, short nasals, and high narrow braincase. There are three synonyms, *P. pavidus, P. sagax*, and *P. zelotes*, all described without suspicion of their relationship to *gratus*, comparisons being made with other forms. The type of *zelotes* has a rather heavy skull with rather small audital bullæ and the skin shows a peculiar combination of worn and unworn pelages. Its resemblance both externally and cranially to the *melanophrys* group is striking and doubtless indicates relationship not very remote. A few immature and otherwise unsatisfactory specimens from Oaxaca and Huajuapam, Oaxaca, are provisionally referred to *gratus.* The relationship of *gratus* to *difficilis* is evidently very close, and where the two are found together they are difficult to distinguish by any character except size, and this is almost covered by variation.

Specimens examined.—Total number 69, from localities as follows:

Hidalgo: Ixmiquilpan, 1; Pachuca, 6; Tula, 2; Zimapan, 2.
Mexico: Ajusco, 1; Tlalpam, 28.
Michoacan: La Palma, 1; Patzcuaro, 5; Querendaro, 3; Zamora, 12.
Oaxaca: Huajuapam, 3; Oaxaca, 1; Tamazulapam, 1.
Queretaro: Tequisquiapam, 3.

PEROMYSCUS TRUEI GENTILIS OSGOOD.

Peromyscus gratus gentilis Osgood, Proc. Biol. Soc. Wash., XVII, pp. 61–62, Mar. 21, 1904.

Type locality.—Lagos, Jalisco, Mexico.

Geographic distribution.—North central Mexico, chiefly in the States of Durango, Zacatecas, and northern Jalisco; east to southern Coahuila.

Characters.—Similar to *P. gratus*, but paler; sides of head much more fulvous; molar teeth slightly smaller.

Color.—Unworn pelage: Upperparts pale ochraceous buff, lightly mixed with dusky; middle of back with a slight concentration of dusky-tipped hairs; top of head, ear tufts, etc., with a predominance of buffy; sides of head nearly clear ochraceous buff, with a slight tinge of grayish between eye and base of ear; eyelids black; underparts white; hands and feet white; tarsal joint dusky; tail bicolor, blackish above, white below. Worn pelage: Upperparts varying from clear bright ochraceous buff on back and rump to grayish buff about head and shoulders, sometimes with a fine mixture of cinnamon-tipped hairs throughout; underparts white; tail dusky brownish above, white below.

Skull.—As in typical *P. gratus*, having the same large braincase, short depressed rostrum, and relatively large audital bullæ; molar teeth slightly smaller.

Measurements.—Average of 10 adult topotypes: Total length, 201 (194–210); tail vertebræ, 111.7 (103–120); hind foot 23.8 (23–24.5); ear from notch (dry) 18.6 (18–19.3).

Type specimen.—No. 78937 U. S. National Museum, Biological Survey Collection. ♂ adult. June 27, 1896. E. W. Nelson and E. A. Goldman. Specimen in good condition.

Remarks.—This form is practically like *gratus* except in color, which is decidedly paler and more nearly like that of *truei*. However, it is somewhat brighter even than *truei* and also differs from it in its longer tail and cranial characters. Intergradation with both *truei* and *gratus* is amply shown by various specimens.

Specimens examined.—Total number 36, from localities as follows:

Coahuila: Sierra Encarnacion, 1 (approaching *truei*); Sierra Guadalupe, 1.
Chihuahua: Parral, 1; Sierra Madre, 40 m. east of Batopilas, 1.
Durango: Coyotes, 6; Durango, 2.
Guanajuato: Silao, 3 (approaching *gratus*).
Jalisco: Lagos, 12.
San Luis Potosi: Jesus Maria, 3.
Zacatecas: Valparaiso, 4; Zacatecas, 2.

PEROMYSCUS NASUTUS (ALLEN).

(Pl. IV, fig. 8.)

Vesperimus nasutus Allen, Bull. Am. Mus. Nat. Hist., N. Y., III, pp. 299-300, June, 1891.
[*Peromyscus*] *truei nasutus* Trouessart, Catal. Mamm., p. 517, 1897.

Type locality.—Estes Park, Colorado.

Geographic distribution.—Mountains of Colorado, New Mexico, eastern Arizona, and western Texas, chiefly east of the Continental Divide.

Characters.—Color about as in *rowleyi*, but more grayish in summer pelage; size larger; size and proportions about as in *attwateri*, color paler and more grayish; skull with longer rostrum; external ears sometimes nearly as large as in *truei;* annulations of tail finer than in *rowleyi.*

Color.—Unworn pelage: Practically as in *rowleyi;* general effect of upperparts grayish wood brown to isabella color; ochraceous shades seldom or never accentuated; decidedly paler and more grayish than in *attwateri.* Worn pelage: Relatively dull, much duller than in either *rowleyi* or *truei;* general effect of upperparts pale grayish fawn lightly vermiculated with darker, occasionally brightening to a tinge of pinkish buff, but rarely or never attaining the ochraceous shades usual in *rowleyi*, *attwateri*, and *truei.* Adolescent and juvenal pelages: Darker than in *rowleyi;* plumbeous underfur deeper-colored and more mixed with dusky, occasionally quite sooty.

Skull.—About as in *attwateri*, but rostrum averaging slightly longer and audital bullæ more nearly spherical; similar to that of *rowleyi* but larger: audital bullæ actually somewhat larger than in *rowleyi* but relatively little or not at all larger; audital bullæ sometimes actually nearly as large as in small specimens of *truei*, but relatively smaller; rostrum quite decidedly longer than in *truei;* nasals narrower and less flattened; zygomata more compressed anteriorly, less deeply notched by infraorbital foramen; braincase averaging slightly broader and shallower.

Measurements.—Average of 5 specimens from Gold Hill, Colo.: Total length 195 (180-210); tail vertebræ 99 (91-105); hind foot 23.2 (22-24); ear from notch (dry) 19.7 (18.5-20.5). Of 10 adults from Grants, N. Mex.: 204 (199-206); 102 (98-109); 22.8 (22-24); 20.3 (19.5-21).

Type specimen.—No. $\frac{3397}{2670}$ American Museum of Natural History, New York. ♂ adult. Jan. 20, 1891. W. G. Smith. Skin rather poorly formed; tip of tail imperfect; underparts greasy. Skull lacking posterior part of braincase, basioccipital, right audital bulla, and smaller adjacent parts.

Remarks.—This species may be easily confused with either *P. truei* or *P. b. rowleyi*, and it is only after examination of a large amount of material (chiefly recently acquired) and the testing of various alternatives that its distinctness becomes apparent. The most obvious characters for separating *truei* and *rowleyi*, namely, size of external ears and of audital bullæ, are somewhat combined in *nasutus*. Since *nasutus* occurs throughout a considerable part of the ranges of *truei* and *rowleyi* confusion is further induced. However, *nasutus* has external ears and audital bullæ slightly larger than in *rowleyi* and slightly smaller than in *truei*. This is true as regards actual size, but since *nasutus* is larger than either *rowleyi* or *truei*, it is evident that its audital bullæ are relatively but little larger than those of *rowleyi*. It differs from both *rowleyi* and *truei* in its larger size, more grayish color (particularly in worn and partly worn conditions of pelage), and more elongate nasals. Its pelage is rather soft and full, more so than in *rowleyi*, and though not often so long, of a slightly different character from that of *truei*. In adolescent pelage there is a softness or fullness not seen in either *truei* or *rowleyi*, and its color then, though elusive of description, is quite characteristic. Although *nasutus* has of late been associated with *truei*, it now seems that its closest affinities are elsewhere, quite probably with *difficilis*, and possibly with *rowleyi*. It is smaller than *difficilis*, has a shorter tail, and more grayish color, but its skull, though smaller, with smaller audital bullæ, has the same general form, and certain specimens of *difficilis*, particularly those from the northern part of its range, appear to decidedly approach *nasutus*.

Specimens examined.—Total number 188, from localities as follows:

Arizona: Springerville, 8.
Colorado: Boulder, 20; Canyon City, 1; Estes Park, 8; Gold Hill, 9; Trinidad, 10.
New Mexico: Arroyo Hondo, 2; Arroyo Seco, 7; Capitan Mountains, 25; Catskill, 4; Cienequilla, 11; Clayton, 1; Corona, 1; Coyote Creek, 3; Datil Mountains, 2; Emery Peak, 2; Folsom, 4; Fort Wingate, 1; Gallo Canyon, 1; Glorieta, 1; Grants, 17; Hall Peak, 2; Jicarilla Mountains, 19; Mora, 1; Pecos River, 3; Rinconada, 1; San Andres Mountains, 13; Santa Rosa, 3; Sierra Grande, 11; Tucumcari, 1.

PEROMYSCUS POLIUS Osgood.

Peromyscus polius Osgood, Proc. Biol. Soc. Wash., XVII, p. 61, Mar. 21, 1904.

Type locality.—Colonia Garcia, Chihuahua, Mexico.

Geographic distribution.—Known only from the type locality.

Characters.—Similar to *P. b. rowleyi* and *P. b. attwateri* but larger (hind foot 25–26) and more grayish; molar teeth relatively large and heavy; hind feet and *tarsal joint white.*

Color.—General color of upperparts grayish broccoli brown, produced by a ground color of pinkish buff mixed with dusky; narrow lateral line clear pinkish buff; head slightly more grayish than body, particularly on cheeks; a narrow dusky orbital ring; tuft at base of ear mixed grayish and buffy; ears grayish dusky, narrowly margined with buffy white; underparts pure white; feet and carpal and tarsal joints white; tail bicolor; pale brownish dusky above, white below.

Skull.—Similar in general form to that of *rowleyi*, but decidedly larger; molar teeth decidedly larger; palatine slits longer; audital bullæ actually about same size, relatively smaller. Size about as in large specimens of *attwateri*, but molar teeth actually and relatively larger and heavier.

Measurements.—Average of 8 adult topotypes: Total length 218.5 (210–234); tail vertebræ 117 (111–120); hind foot 25.8 (25–26); ear from notch (dry) 18.1 (17.2–18.5).

Type specimen.—No. 98226 U. S. National Museum, Biological Survey Collection. ♀ adult. June 26, 1899. E. W. Nelson and E. A. Goldman. Specimen in good condition.

Remarks.—This species nearly equals *P. difficilis* in size, but its shorter tail and ears at once distinguish it without recourse to the skull, in which the audital bullæ are scarcely more than half the size of those of *difficilis*. It considerably resembles *rowleyi*, and especially *attwateri*, but is readily distinguished from either by its white 'ankles,' a character that may possibly indicate that its real relationship is with the much smaller but generally similar species, *P. eremicoides*. Nearly typical *rowleyi* is found at the type locality of *polius* and preserves its distinctness there.

Specimens examined.—Total number 11, all from the type locality.

Key to subspecies of Peromyscus difficilis.

Color very dark, chiefly rich blackish brown and black .... *P. d. felipensis*
Color paler, chiefly ochraceous buff more or less mixed with dusky.
    Size averaging smaller; pelage closer and more glossy; skull with smaller braincase .... *P. difficilis*
    Size averaging larger; pelage looser and duller; skull with larger braincase. *P. d. amplus*

PEROMYSCUS DIFFICILIS (ALLEN).

(Pl. V, fig. 6.)

Vesperimus difficilis Allen, Bull. Am. Mus. Nat. Hist., N. Y., III, pp. 298–299, June, 1891.

[*Peromyscus*] *difficilis* Trouessart, Catal. Mamm., p. 518, 1897.

Type locality.—Sierra de Valparaiso, Zacatecas, Mexico.

Geographic distribution.—Sierra Madre from southwestern Chihuahua south through Durango and Zacatecas, then east and southeast to certain mountainous parts of Guanajuato and northern Hidalgo, and thence north through parts of San Luis Potosi to mountains of southern Coahuila. Chiefly in Transition zone.

Characters.—Size rather large (hind foot 24–28); tail long, always longer than head and body; ears rather large; relatively larger than in other large Mexican species; general appearance that of a decidedly larger and longer tailed counterpart of *P. truei gratus;* skull with rather long nasals, full braincase, and large audital bullæ.

Color.—Unworn pelage: Similar in general to that of *P. truei gratus*, somewhat darker than in *truei;* ground color of upperparts ochraceous buff mixed with dusky, chiefly disposed as fine lines and rather dominating the general effect; sides, except lateral line, same as back; lateral line clear ochraceous buff, and usually fairly well defined; nose, postorbital region, and general facial region above lateral line quite distinctly grayish; ears thinly haired, margined with whitish, tufts at bases about the same color as surrounding parts; a narrow blackish orbital ring; underparts creamy white, usually without any pectoral spot; feet white, tarsal joint with a small dusky marking; tail sharply bicolor, blackish brown above, white below. Worn pelage: General effect of upperparts varying from dull fulvous drab to rather bright cinnamon; head and shoulders usually considerably more grayish than back and rump; lateral line scarcely or not at all distinct from rest of sides.

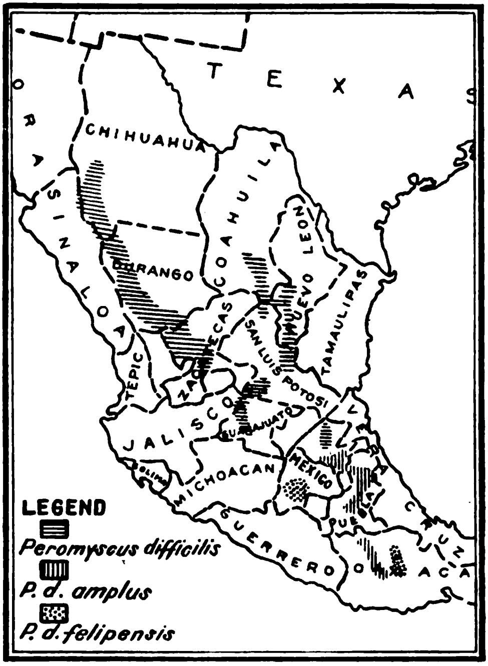

FIG. 7.—Distribution of *Peromyscus difficilis* and subspecies.

Skull.—Similar in general form to that of *nasutus* but larger, heavier, and with larger audital bullæ; braincase full and deep; interorbital space narrow; supraorbital border not beaded and seldom very sharp-angled, never forming any distinct shelf as in *melanophrys;* nasals quite elongate; teeth moderate; audital bullæ large and full, relatively smaller than in *gratus* but decidedly larger than in most other Mexican species.

Measurements.—Average of 10 adult topotypes: Total length 233 (212–255); tail vertebræ 127 (115–143); hind foot 26.3 (25.5–28); ear from notch (dry) 21 (19.5–23.5).

Type specimen.—No. $\frac{1824}{1263}$ American Museum of Natural History, New York. ♂ adolescent. July 27, 1889. Audley C. Buller. Skin rather badly made, feet and tail twisted, and underparts stained, but still fairly satisfactory for comparison. Skull with cracks in basioccipital and interorbital part of frontal; anterior part of right zygoma absent.

Remarks.—The relationship of *difficilis* and its subspecies to the *truei* group is quite apparent, but there is no absolute connection between the two groups unless it be through *nasutus*, which may be a northern representative of *difficilis*. Thus in south central Mexico the two groups are represented by *difficilis* and *gratus*, and are there usually easily distinguishable by size alone; in New Mexico, Colorado, etc., are *truei* and *nasutus*, representatives of the same two groups, but with characters more nearly approximating each other, and therefore more difficult to distinguish. *P. difficilis* is readily distinguishable from other Mexican species of corresponding size by its larger ears and its unbeaded skull with large rounded audital bullæ. The bullæ are approached in size by those of *P. melanophrys*, but in that species the external ears are decidedly smaller and the supraorbital border of the skull is developed into a slight shelf often even suggesting a bead. Variation in cranial characters is considerable, but most of it appears in specimens from intermediate localities. Specimens from Hidalgo for the most part appear to be intermediate between *difficilis* and *amplus*. A large series from near Jesus Maria, San Luis Potosi, shows cranial variations almost covering the differences from *nasutus* to *amplus*. The most northerly specimens, as those from near Guadalupe y Calvo, have bullæ uniformly smaller than the average of typical *difficilis*, and appear to approach *nasutus*. They are best referred to *difficilis*, however, and the difference between them and *nasutus* is still sufficient to make it advisable to hold the two for the present as distinct species. Specimens from the mountains of Coahuila also are not quite typical, being unusually grayish, but this is perhaps due, at least in part, to age and condition of pelage. Another possible relative of *difficilis* is *P. polius*, which has a shorter tail, white tarsal joints, and also cranial characters.

Specimens examined.—Total number 255, from localities as follows:

Chihuahua: Batopilas (mountains 65 m. east), 6; mountains near Guadalupe y Calvo, 17.
Coahuila: Carneros, 2; Sierra Encarnacion, 19; Sierra Guadalupe, 26.
Durango: El Salto, 10.
Guanajuato: Santa Rosa, 20.

Hidalgo: Encarnacion, 9; Ixmiquilpan, 7; Zimapan, 14.
San Luis Potosi: Charcos, 5; mountains near Jesus Maria, 37
Tamaulipas: Miquihuana, 25.
Zacatecas: Plateado, 18; Valparaiso Mountains, 26; Zacatecas, 14.

PEROMYSCUS DIFFICILIS AMPLUS Osgood.

Peromyscus amplus Osgood, Proc. Biol. Soc. Wash., XVII, pp. 62–63, Mar. 21, 1904.

Type locality.—Coixtlahuaca, Oaxaca, Mexico.

Geographic distribution.—Mountains of north central Oaxaca, Puebla, southeastern Veracruz, and southern Hidalgo.

Characters.—Similar to *P. difficilis* and *P. d. felipensis;* color much as in *difficilis* but duller; size and cranial characters as in *felipensis;* color very much paler; pelage long and lax, usually lacking the gloss or luster shown in *difficilis;* skull large, with a broad full braincase.

Color.—Type: General effect of upperparts uniform clay color produced by a ground color of ochraceous buff and a fine peppery mixture of dusky; lateral line rather broad, ochraceous buff; forehead and orbital region from posterior base of whiskers to ear grayish; anterior base of whiskers buffy; underparts creamy white, with a well-developed ochraceous buff pectoral spot; feet white, tarsal joints marked with dusky; tail dusky brownish above, white below.

Skull.—Similar in general to that of *difficilis*, but larger and heavier throughout; rostrum and nasals broader and heavier; practically as in *felipensis*, but braincase averaging slightly higher and fuller; audital bullæ large, but relatively slightly smaller than in *difficilis;* interorbital space narrow; no supraorbital bead.

Measurements.—Average of 10 adult topotypes: Total length 248 (235–260); tail vertebræ 136 (128–145); hind foot 27 (26–28); ear from notch (dry) 20.9 (19.5–21.8).

Type specimen.—No. 70158 U. S. National Museum, Biological Survey Collection. ♀ adult. Nov. 12, 1894. E. W. Nelson and E. A. Goldman. Specimen in good condition.

Remarks.—In cranial characters, *amplus* differs from *difficilis* in the same way that *felipensis* does. Its color is similar to that of *difficilis*, but there is less dusky mixture and this is not usually disposed as fine lines, but as a fine peppery sprinkling. The pelage has a peculiar quality which baffles description, having less gloss or luster than in most other species. In this respect it resembles many specimens of the *melanophrys* group. It is easily distinguished from *melanophrys* by the absence of a definite supraorbital ridge and by its larger audital bullæ. It intergrades with both *difficilis* and *felipensis.* Specimens from northern Hidalgo show considerable approach to *difficilis*, while among series of *felipensis* are occasional paler specimens evidently aproaching *amplus.*

Specimens examined.—Total number 133, from localities as follows:

Hidalgo: Irolo, 16; Marques, 5; Pachuca, 6; Real del Monte, 8; Tula, 14; Tulancingo, 8.
Oaxaca: Coixtlahuaca, 16; Tamazulapam, 12.
Puebla: Chalchicomula, 9; Esperanza, 18.
Tlaxcala: Apixaco, 2.
Veracruz: Maltrata, 6; Perote, 14.

PEROMYSCUS DIFFICILIS FELIPENSIS MERRIAM.

Peromyscus felipensis Merriam, Proc. Biol. Soc. Wash., XII, pp. 122–123, Apr. 30, 1898.

Type locality.—Cerro San Felipe, Oaxaca, Mexico. Altitude 10,300 feet.

Geographic distribution.—High elevations (8,000 feet to 11,000 feet) on the mountains surrounding the Valley of Mexico; reappearing at similar elevations in the mountains northeast of the city of Oaxaca.

Characters.—General characters as in *difficilis* and *amplus;* color very much darker than in either, rich blackish brown and pure black predominating; pelage somewhat heavier, more woolly; ears averaging smaller; size slightly larger than in *difficilis;* skull larger and heavier; braincase averaging flatter than in *amplus.*

Color.—Unworn pelage: Upperparts mixed grayish ochraceous buff and black; general effect on dorsum nearly black, lightly sprinkled with buffy gray, on sides nearly hair brown becoming more buffy toward lateral line, which is ochraceous buff mixed with dusky and seldom very sharply contrasted with rest of sides; sides of face, nose, and forehead tinged with grayish; blackish markings everywhere accentuated; orbital ring and spot at base of whiskers sharply black; spot on each side of nose in front of whiskers, buffy; white of lips ascending to lower edge of dusky spot at base of whiskers; feet white, tarsal joint with a broad blackish brown marking; tail sharply bicolor, blackish brown above, white below, but usually with some mixture of dusky on the underside near base; underparts creamy white modified by the blackish slate undercolor which is never entirely concealed; pectoral region broadly ochraceous buff. Worn pelage: Upperparts more uniform, with dorsum less differentiated; ends of hairs worn down and exposing considerable of the blackish slate undercolor; general effect varying from dark hair brown to sepia; lateral line scarcely apparent; underparts much modified by blackish slate undercolor. Young in first coat: Median upperparts deep blackish slate, very lightly flecked with gray; sides slate gray lightly vermiculated with darker.

Skull.—Similar to that of *difficilis*, but somewhat larger; rostrum and nasals broader and heavier; audital bullæ relatively smaller;

braincase averaging broader and shallower; practically as in *amplus* but braincase averaging slightly shallower.

Measurements.—Average of 10 adult topotypes: Total length 241.5 (225–248); tail vertebræ 127 (118–132); hind foot 26.8 (25.5–27.5); ear from notch (dry) 20.4 (19–21.7).

Type specimen.—No. 68409 U. S. National Museum, Biological Survey Collection. ♂ adult. Aug. 22, 1894. E. W. Nelson and E. A. Goldman. Specimen in good condition.

Remarks.—Its very dark color readily distinguishes this form from *difficilis* and *amplus*, and its cranial characters are likely to prevent confusion with any others. The audital bullæ are not so full and rounded as in *difficilis* but still are larger than in most other Mexican species. *P. lepturus* also is dark colored, but will scarcely be confused with *felipensis* on account of its smaller size, smaller audital bullæ, and relatively larger teeth. In nearly all other Mexican species at all similar to *felipensis* the interorbital region is broader, with some development of a supraorbital ridge.

The distribution of *felipensis* is curiously interrupted, Cerro San Felipe being apparently quite isolated from the other localities from which the form is known, while *amplus* is found on mountains in the intervening region. Possibly *felipensis* occupies higher or more humid regions.

Specimens examined.—Total number 41, from localities as follows:

Mexico: Ajusco, 3; Amecameca, 8; Toluca Valley, 5; Salazar, 4.
Oaxaca: Cerro San Felipe, 21.

PEROMYSCUS BULLATUS Osgood.

(Pl. VII, fig. 7.)

Peromyscus bullatus Osgood, Proc. Biol. Soc. Wash., XVII, p. 63, Mar. 21, 1904.

Type locality.—Perote, Veracruz, Mexico.

Geographic distribution.—Known only from the type locality.

Characters.—Similar in general to *P. truei* and *P. difficilis;* ears very large; audital bullæ greatly inflated; tail shorter than head and body.[a]

Color.—Similar to that of *P. truei*, but richer, more nearly approaching tawny; slightly paler than in *difficilis;* sides and ground color of upperparts tawny ochraceous; dorsum with considerable dusky producing a general effect of nearly broccoli brown; top of head and nose broccoli brown; sides of head between base of ear and eye distinctly grayish; a narrow dusky orbital ring; underparts creamy white; feet white, tarsal joint marked with dusky; tail brownish dusky above, white below.

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[a] The tail of the type and only specimen is slightly imperfect, having lost the extreme tip, but its distal attenuation indicates that it was naturally but little longer, and certainly much shorter than that of *P. difficilis*.

Skull.—Similar in general form to *P. truei;* size larger than *P. truei*, but smaller than *P. difficilis;* audital bullæ very much inflated, actually as well as relatively larger than in any other known species of the genus; braincase rounded and rather inflated; interorbital constriction relatively wider than in *difficilis;* nasals and palatine slits rather long; molar teeth large, actually larger than those of *truei* and nearly equalling those of *difficilis.*

Measurements.—Type: Total length, 200; tail vertebræ, 93+; hind foot, 23; ear from notch (dry), 25.

Type specimen.—No. 54405 U. S. National Museum, Biological Survey Collection. ♀ adult. June 3, 1893. E. W. Nelson and E. A. Goldman. Specimen in good condition except that extreme tip of tail is broken off.

Remarks.—The relationships of this species are clearly with *P. truei* and *P. difficilis.* Its short tail and light color easily distinguish it from *difficilis*, and its enormous audital bullæ at once separate it from *truei.* The external ears also are very large, slightly exceeding those of *difficilis* as well as of all other species. It is conceivable that the single specimen known may be an abnormal individual of the *difficilis* group, but its characters are pronounced and not paralleled anywhere in the considerable variation found in *difficilis.*

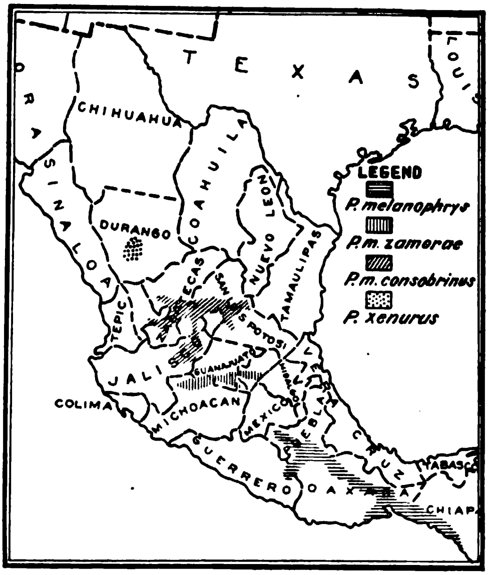

FIG. 8.—Distribution of *Peromyscus melanophrys*, *P. xenurus*, and subspecies.

Specimens examined.—One, the type.

Key to Subspecies of Peromyscus melanophrys.

Color darker; a large buffy pectoral spot usually present................*P. m. zamoræ*
Color paler; underparts usually pure white or with only traces of a pectoral spot.
  Size larger; tail averaging more than 140; skull usually more elongate. South of the City of Mexico................*P. melanophrys*
  Size smaller; tail averaging less than 140; skull relatively shorter, with shorter nasals and larger audital bullæ. North of the City of Mexico. *P. m. consobrinus*

PEROMYSCUS MELANOPHRYS (COUES).

(Pl. V, fig. 3.)

Hesperomys melanophrys Coues, Proc. Acad. Nat. Sci. Phila., pp. 181-182, Dec. 15, 1874.

Peromyscus leucurus Thomas, Ann. & Mag. Nat. Hist., Ser. 6, XIV, pp. 364–5, Nov., 1894.—Tehuantepec, Oaxaca, Mexico.

Peromyscus leucurus gadovii Thomas, Ann. & Mag. Nat. Hist., Ser. 7, XI, pp. 484–485, May, 1903.—San Carlos (=Yautepec), Oaxaca, Mexico.

P[eromyscus] melanophrys Allen, Bull. Am. Mus. Nat. Hist., N. Y., IX, p. 51, Mar. 15, 1897.

Type locality.—Santa Efigenia, Oaxaca, Mexico.

Geographic distribution.—Arid Tropical and Lower Sonoran region of south central Mexico from sea level to arid mountains of 5,000 feet altitude. States of Chiapas, Guerrero, Morelos, Oaxaca, and Puebla.

Characters.—Size rather large; tail very long (usually more than 140 mm.), annulations rather coarse but covered with short, stiff hairs; tail frequently tipped with white; ears large and nearly naked; heel hairy, occupying about one-fifth of the entire length of the foot; general color cinnamon or pale buffy finely flecked with black, no definite lateral line; a black orbital ring and conspicuous patch of gray around it; skull with a sharp-angled supraorbital ridge, but without an interior sulcus as in *banderanus*.

Color.—No. 68658, Oaxaca City, Oaxaca. Adult ♀, June 13, 1894: Upperparts tawny ochraceous very finely lined with dusky; sides same color as back to line of demarcation between upper and under color; feet white, slightly dusky about 'ankles'; base of whiskers and ring around eye sharply black, remainder of face chiefly gray, which extends back to the base of the ear, and is somewhat mixed with tawny on forehead and lower cheeks; tail bicolor, dusky above, white below; underparts creamy white, not quite subduing the plumbeous underfur. No. 68404, Oaxaca City, ♀ adult, Aug. 15, 1894: Similar to the above, but decidedly darker, the ground color apparently somewhat paler and less rufescent and the admixture of dusky much greater, causing the general color to appear russet or Mars brown; otherwise similar.

Skull.—Size medium, smaller than in *mexicanus;* rostral part rather depressed as well as occipital, giving a nearly even curve to the outline of the skull; a definite supraorbital ridge present, which is often developed into a trenchant shelf but not bounded on the inner side by a deep sulcus; temporal region somewhat swollen; nasals of moderate length and nearly even width, shorter and less cuneate than in *mexicanus;* braincase narrower and audital bullæ smaller than in *difficilis;* teeth about same size or slightly smaller than in *mexicanus;* audital bullæ slightly larger.

Measurements.—Average of 3 adults from mountains near Tonala, Chiapas: Total length, 269 (262–275); tail vertebræ, 149 (146–155); hind foot, 28; ear from notch (dry), 19.3 (18.5–21). A very large individual from Yaganiza, Oaxaca: 280; 163; 29. Average of 4 adults from Totolapa, Oaxaca: 250; 154; 28.

Type specimen.—No. $\frac{10183}{12453}$ U. S. National Museum. ♀ adult. Skin and skull, collected July 11, 1871, by F. Sumichrast. The skin appears to have been preserved in alcohol and later renovated. It is, however, in fairly good condition. The tail vertebræ have not been removed, but have been strengthened by a wire along their length outside. The right ear is somewhat torn, but the left is intact except that it seems to have lost the small amount of hair which originally clothed it. The condition of the pelage is of slight wear, and the general color of the upperparts is cinnamon tinged with fawn. The skull lacks the basioccipital and supraoccipital and the anterior part of the nasals is slightly broken. The teeth are perfect and almost unworn. The mandibles are perfect, except the angular processes which are slightly broken.

Remarks.—*P. melanophrys* is the representative of a rather striking group of large, very long-tailed mice inhabiting the more arid regions of southern Mexico. According to Mr. Nelson, it is found living chiefly among rocks. It may be distinguished from nearly all the other species of Mexico by its very long tail and slightly beaded skull. Like other members of the genus, it is subject to considerable variation in color, most of which seems to be due to age. In nearly all series numbering upward of 10 specimens the older individuals are brighter colored, and occasional very old ones are exceptionally bright. Young specimens may be either brownish or pale buffy, apparently according to stage of development. *P. gadovii* of Thomas seems to represent specimens in the darker stage. A series from Oaxaca City, where '*gadovii*' is said to be found (Thomas, l. c.), contains both light and dark examples. In any event, '*gadovii*' becomes a synonym, as the type of *melanophrys*, which was not accessible to Thomas, is in the darker stage or phase. The relationship of *P. leucurus* to *melanophrys* was also evidently not suspected by its describer. One specimen from Tehuantepec, the type locality of *leucurus*, is somewhat immature, but agrees in every way with others of the same age from various parts of range of the species. The type of *leucurus* is rather paler than is usual throughout the group.

Specimens examined.—Total number 85, from localities in Mexico, as follows:

Chiapas: Near Tonala, 9; San Bartolome, 1; San Vicente, 1.

Guerrero: Ayusinapa, 1; Sochi, 1; Tlalixtaquilla, 7; Tlapa, 1.

Morelos: Cuernavaca, 12; Yautepec, 2 (aberrant); Yecapixtla, 2.

Oaxaca: Cuicatlan, 1; Las Vacas, 2; Mitla, 1; Puerto Angel, 1; San Bartolo, 2; San Carlos, 1; San Miguel, 1 (aberrant); Oaxaca, 11; Santa Efigenia, 1 (type); near Tehauntepec, 2; Tlapancingo, 1; near Totolapa, 8; Yaganiza, 2.

Puebla: Acatlan, 1 (approaching *consobrinus*); Chalchicomula, 1; Piaxtla, 11; Tehuacan, 1 (approaching *consobrinus*).

PEROMYSCUS MELANOPHRYS ZAMORAE Osgood.

Peromyscus melanophrys zamorae Osgood, Proc. Biol. Soc. Wash., XVII, pp. 65-66, Mar. 21, 1904.

Type locality.—Zamora, Michoacan, Mexico.

Geographic distribution.—South central Mexico between the ranges of *melanophrys* and *consobrinus;* known from a few localities in the states of Hidalgo and Michoacan.

Characters.—Similar to *P. melanophrys*, but averaging slightly larger and darker; a large tawny pectoral spot present; skull comparatively broad and heavy; teeth large.

Color.—Similar in general to that of *P. melanophrys*, but apparently somewhat darker, the difference in this respect being very slight if any. Adults with a broad band of tawny across pectoral region between forelegs. Upper side of tail more nearly black than in *melanophrys.*

Skull.—Similar to that of *melanophrys*, but slightly larger and heavier; braincase fuller and broader; audital bullæ larger; supraorbital beads less trenchant and forming ridges rather than shelves anteriorly; molar teeth larger; other characters similar.

Measurements.—Type: Total length, 260; tail vertebræ, 141; hind foot, 29. Average of 7 young adult topotypes: Total length, 259; tail vertebræ, 144; hind foot, 28.4; ear from notch (dry), 20 (19–21).

Type specimen.—No. 120288 U. S. National Museum, Biological Survey Collection. ♂ adult. Jan. 20, 1903. E. W. Nelson and E. A. Goldman. Specimen in good condition.

Remarks.—All adult specimens of this form thus far examined have the tawny pectoral marking highly developed. The constancy of this character may be doubted, as it is of such irregular occurrence in this genus. In the present case, while not diagnostic, it seems to be a character of importance. Of 76 specimens of *melanophrys* and *consobrinus*, only 4 have pectoral spots, and these are small and indistinct. Of 19 typical specimens of *zamoræ*, all have well-marked pectoral spots except 2 plumbeous young, which have only traces.

The majority of the series from Zamora are adolescents and, perhaps for this reason, are exceptionally dark. Even those that have not passed beyond the plumbeous juvenile pelage are decidedly darker than comparable specimens of typical *melanophrys.* Two adults, however, show only very slightly darker shades than *melanophrys.* Specimens from Zimapan, Hidalgo, are questionably referred to this form, but in cranial characters they approach *consobrinus.* Four specimens from Querendaro seem to be typical *zamoræ.*

Specimens examined.—Total number 43, from localities in Mexico as follows:

Hidalgo: Zimapan, 24 (aberrant).
Michoacan: Querendaro, 4; Zamora, 15.

PEROMYSCUS MELANOPHRYS CONSOBRINUS Osgood.

Peromyscus melanophrys consobrinus Osgood, Proc. Biol. Soc., Wash., XVII, p. 66, March 21, 1904.

Type locality.—Berriozabal, Zacatecas, Mexico.

Geographic distribution.—Southern part of the Mexican tableland; Sonoran zone in states of San Luis Potosi, Jalisco, Zacatecas, etc.

Characters.—Similar to *P. melanophrys*, but tail slightly shorter; skull with larger audital bullæ and other slight peculiarities.

Color.—As in *melanophrys.* Topotype No. 58028, in full winter pelage (December): Upperparts and sides tawny ochraceous, thickly lined with black to the edge of a narrow tawny lateral line: orbital ring black, sharply contrasting with a grayish area about it which extends from the base of the whiskers around the eye to the anterior base of the ear; underparts creamy white with a very small tawny pectoral spot; tail bicolor, white below, dusky above; feet creamy white, 'ankles' dusky.

Skull.—Similar to that of *melanophrys*, but somewhat shorter: nasals shorter and slightly broader; audital bullæ larger; braincase more bulging and less elongate.

Measurements.—Type: Total length, 250; tail vertebræ, 131; hind foot, 26.5. Average of 5 adult topotypes: Total length, 256; tail vertebræ, 135; hind foot, 27.5; ear from notch (dry), 19 (18–19.8).

Type specimen.—No. 79626 U. S. National Museum, Biological Survey Collection. ♀ adult. July 10, 1896. E. W. Nelson and E. A. Goldman.

Remarks.—This subspecies is not strongly marked, but its characters, such as they are, have great constancy throughout its range. It is apparently the form of the Mexican tableland, but its distribution may be continuous with that of *zamoræ* and thence with true *melanophrys.* Specimens from Zimapan, Hidalgo, appear to approach *consobrinus* in cranial characters but retain the coloration of *zamorae*.

Specimens examined.—Total number 38, from localities in Mexico as follows:

Aguas Calientes: Chicalote, 1.
Guanajuato: Silao, 3.
Jalisco: Atemajac, 16 (aberrant); Colotlan, 1.
San Luis Potosi: Ahualulco, 1; Hacienda La Parada, 3.
Zacatecas: Berriozabal, 12; Monte Escobedo, 1.

PEROMYSCUS XENURUS Osgood.

Peromyscus xenurus Osgood, Proc. Biol. Soc. Wash., XVII, p. 67, March 21, 1904.

Type locality.—Durango, Durango, Mexico.

Geographic distribution.—Known only from the type locality.

Characters.—Similar in size and proportions to *P. melanophrys;* ground color more nearly fawn than tawny; pectoral spot well developed; tail black, except a narrow ventral line of white; hind feet clouded with dusky.

Color.—Type, in fresh pelage except on rump: Ground color of upperparts grayish fawn color, gradually becoming more grayish anteriorly, so that, on account of the mixture of black throughout, the effect from the middle of the back forward passes from mixed fawn color through drab to hair brown; the rump, which is still in worn pelage, is fawn color; lower cheeks bright fawn color blending with gray, which covers most of the face from the base of the ears forward to the nose; underparts white except patch of bright fawn color extending from bases of forelegs across breast; hind feet clouded with dusky brown to base of toes, which are creamy white; tail black all around except a narrow stripe of white on the underside occupying scarcely more than one-fifth of the entire surface of the tail except distally, where, the diameter of the tail being very slight, it nearly covers the underside.

Skull.—Similar in general to that of *P. m. consobrinus;* nasals noticeably shorter; anterior palatine foramina shorter; postpalatal notch shorter and wider.

Measurements.—The type and 1 adult topotype, respectively: Total length 246, 248; tail vertebræ 142, 140; hind foot 28, 28.

Type specimen.—No. 94518 U. S. National Museum, Biological Survey Collection. ♀ adult. July 1, 1898. E. W. Nelson and E. A. Goldman. Specimen in good condition.

Remarks.—This species is easily distinguished from any other of the *melanophrys* group by the combination of large pectoral spot, dusky hind feet, and peculiar tail, with only a narrow line of white on the underside instead of the usual equal division of light and dark areas. It is the northernmost form of the *melanophrys* group, and at present is known only by two specimens from one locality, so doubtless much remains to be learned of its distribution. Eventually it may be found to intergrade with *consobrinus* or *zamorae.*

Specimens examined.—Total number 2, both from the type locality.

PEROMYSCUS MEKISTURUS MERRIAM.

Peromyscus mekisturus Merriam, Proc. Biol. Soc. Wash., XVII, pp. 124–125, Apr. 30, 1898.

Type locality.—Chalchicomula, Puebla, Mexico. Altitude 8,200 feet.

Geographic distribution.—Known only from the type locality.

Characters.—Size medium (hind foot 24): tail very long, equaling three-fourths of total length, well haired and indistinctly bicolor: ears of moderate size; pelage rather full and thick, similar in color and general character to that of the *melanophrys* type, but underparts creamy buff without any white; hind feet except toes chiefly dusky brownish, soles naked, at least medially; skull small with short nasals and unbeaded, much constricted frontals.

Color.—Ground color of upperparts ochraceous buff, becoming paler and more grayish anteriorly and brighter more nearly tawny posteriorly, and throughout mixed uniformly with dusky; back without any definite concentration of dusky, but essentially like sides; sides of face, nose, and forehead grayish; end of nose with a tiny nearly white tuft of hair surmounting rhinarium; orbital ring and spot at base of whiskers dusky; underparts cream buff, becoming paler, almost white on chin and throat; fore feet creamy white, hind feet dusky brownish except on toes and sides of feet; tail dusky brownish above, mixed brownish and whitish below, thus being very indistinctly bicolor.

Skull.—Size small, scarcely as large as that of *gratus;* braincase rather long relatively to rostral part of skull, which appears disproportionately short; frontals much constricted anteriorly; supraorbital border without bead or shelf; zygomata squared anteriorly, somewhat wider posteriorly; audital bullæ moderate, smaller than in *gratus*, but relatively larger than in most other species of similar size; nasals short, flat, slightly cuneate, and but little depressed; interpterygoid fossa wide; posterior palatine foramina nearer to interpterygoid fossa than to anterior palatine foramina; molar teeth moderate, upper incisors very long.

Measurements.—Type: Total length 249; tail vertebræ 155; hind foot 24; ear from notch (dry) 18.4.

Type specimen.—No. 64108 U. S. National Museum, Biological Survey Collection. ♀ adult. March 16, 1894. E. W. Nelson and E. A. Goldman. Specimen in excellent condition.

Remarks.—Although this species is distinct, with no very close allies, it is evidently more nearly related to *melanophrys* and subspecies than to any others. The general color, the character of the pelage, and the very long coarsely-haired tail are essentially as in *melanophrys*. The skull also bears a general resemblance to that of *melanophrys*, but is so much smaller that comparison is difficult.

Specimen examined.—One, the type only.

PEROMYSCUS LEPTURUS MERRIAM.

(Pl. IV, fig. 12.)

Peromyscus lepturus Merriam, Proc. Biol. Soc. Wash., XII, pp. 118–119, Apr. 30, 1898.

Type locality.—Mount Zempoaltepec, Oaxaca, Mexico.

Geographic distribution.—Known only from the type locality.

Characters.—Size medium (hind foot 27); tail about as long as or slightly shorter than head and body, rather coarsely haired, evenly bicolor or nearly uniform dusky above and below; color dark; pelage full, long, and lax; hind feet extensively marked with dusky; soles hairy posteriorly. Skull with rather long nasals, constricted and beadless frontals, large interparietal, and relatively large teeth.

Color.—General effect of back brownish black, lightly mixed with cinnamon; sides, shoulders, and head cinnamon to russet, mixed with brownish black, producing a general effect approximating the bister of Ridgway; ears thinly clothed with soft brown hairs, scarcely or not at all edged with paler; tuft of soft hairs at anterior base of ear black; broad area from side of nose through base of whiskers to and around eye black or brownish black; underparts creamy white, usually modified to bluish gray by the effect of the slaty basal color of the hairs; pectoral region sometimes slightly marked with russet; forearm sooty to carpal joint; forefeet white; dusky of hind leg extending over tarsal joint and over the upper side of the hind foot two-thirds of the distance or quite to the base of the toes; toes and sides of hind feet whitish; tail variable, in some specimens nearly evenly bicolor, blackish above and white below, but usually more or less blackish on the underside near the base, in other specimens uniform blackish above and below.

Skull.—Similar in general form to that of *levipes;* size slightly larger; nasals rather long and palatine slits correspondingly so; zygomata slightly compressed anteriorly, widest posteriorly; frontals small and constricted, not beaded; supraorbital border scarcely even sharp-angled; interparietal rather large; superior outline of skull nearly flat or very slightly arched; molar teeth relatively large, larger than in *levipes* or *mexicanus*, but relatively about the same size as in the smaller species *lophurus* and *simulatus;* audital bullæ moderate, about as in *levipes.*

Measurements.—Average of 7 topotypes: Total length 228 (218–238); tail vertebræ 115 (112–119); hind foot 27 (26–28); ear from notch (dry) 17.3 (16.4–18.2).

Type specimen.—No. 68612 U. S. National Museum, Biological Survey Collection. ♂ adult. July 8, 1894. E. W. Nelson and E. A. Goldman. Specimen in good condition.

Remarks.—This species is the largest of a small group including also *lophurus* and *simulatus.* From either of these it is distinguishable by its larger size, more coarsely haired tail, and less arched skull. The same characters, as well as its dark color and other peculiarities, serve in large measure to distinguish it from *levipes*, *aztecus*, etc. *P. m. totontepecus*, and *P. melanocarpus*, also found on Mount Zempoaltepec, are sometimes similar in color to *lepturus*, but their larger heavier skulls with relatively smaller teeth make close comparison unnecessary.

Specimens examined.—Total number 8, from localities as follows:

Oaxaca: Mount Zempoaltepec at 8,000 feet altitude, 7; Totontepec, 1.

PEROMYSCUS LOPHURUS Osgood.

(Pl. III, fig. 6.)

Peromyscus lophurus Osgood, Proc. Biol. Soc. Wash., XVII, p. 72, Mar. 21, 1904.

Type locality.—Todos Santos, Guatemala. Altitude 8,500 feet.

Geographic distribution.—Highlands of the State of Chiapas, Mexico, and of western Guatemala.

Characters.—Most similar to *P. lepturus*, but smaller and paler; tail long and covered with comparatively long soft hairs, and terminating in a distinct pencil; pelage soft and 'woolly' and rather dull and lusterless; skull with large interparietal and short nasals.

Color.—Type: General effect of upperparts between wood brown and fawn color, with a small dusky area in middle of back; lateral line pale ochraceous buff; underparts white; no pectoral spot; tail sepia brown, unicolor; forearm dusky to wrist, fore feet white; hind feet dusky brownish to base of toes; toes white; orbital ring dusky black, rather narrow, but expanded into a distinct spot in front of eye.

Skull.—Similar to that of *lepturus*, but smaller and with rostral part decidedly shorter; molar teeth actually about same size, relatively larger; interparietal very large. Compared to that of *P. levipes*, the skull of *lophurus* is shorter, with shorter nasals and heavier infraorbital region; the teeth are decidedly heavier and longer and the interparietal larger.

Measurements.—Average of 4 adult topotypes: Total length, 208; tail vertebræ 105; hind foot 24.5; ear from notch (dry) 16.

Type specimen.—No. 77219 U. S. National Museum, Biological Survey Collection. ♂ adult. Dec. 30, 1895. E. W. Nelson and E. A. Goldman. Specimen in good condition.

Remarks.—This very distinct species is easily recognized by its penciled tail and usually by the absence of white on the under side of the tail. All the specimens from Todos Santos have unicolor tails, but 2 from Calel are quite distinctly bicolor, and among 4 from San Cristobal, 2 have unicolor and 2 have imperfectly bicolor tails, indicating that this character is variable. The character of the pelage differs somewhat from most of the smaller species of *Peromyscus* in being dull and soft without the usual gloss, and although rather short it is fine and slightly 'woolly.' Its close allies are *lepturus*, which is larger and has a more flattened skull, and *simulatus*, which is decidedly smaller.

Specimens examined.—Total number 17, from localities as follows:

Chiapas: Pinabete, 5; San Cristobal, 4.

Guatemala: Calel, 2; Todos Santos, 6.

PEROMYSCUS SIMULATUS Osgood.

(Pl. III, fig. 7.)

Peromyscus simulatus Osgood, Proc. Biol. Soc. Wash., XVII, pp. 72–73, Mar. 21, 1904.

Type locality.—Near Jico, Veracruz, Mexico. Altitude 6,000 feet.

Geographic distribution.—Known only from the type locality.

Characters.—A miniature of *P. lophurus* (hind foot 21); dark markings slightly more intense; skull and teeth very small; tail clothed with long, soft hairs and penciled as in *lophurus;* auditai bullæ relatively large.

Color.—Almost exactly as in *P. lophurus;* dark markings of feet and face slightly more intense; tail chiefly brown, but with a narrow line of white on under side.

Skull.—Size very small; similar in general to that of *P. lophurus*, but with more inflated braincase and depressed rostrum; auditai bullæ relatively larger; interorbital constriction relatively wider; teeth very small.

Measurements.—Type: Total length 169; tail vertebræ 87; hind foot 21; ear from notch (dry) 14.3.

Type specimen.—No. 55028 U. S. National Museum, Biological Survey Collection. ♀ adult. July 12, 1893. E. W. Nelson and E. A. Goldman. Specimen in good condition.

Remarks.—This small species is not closely related to any known species except *P. lophurus*, of which it is almost an exact miniature. Its skull is even smaller than that of *P. melanotis*, which occurs in the same region. It has, however, no relationship whatever to *melanotis*. Its small size, crested tail, and dark brown feet amply suffice to distinguish it from all other known species. A single specimen (No. 51177) from Tlalpam, Valley of Mexico, may represent an undescribed subspecies of *simulatus*. It is quite immature, but seems to differ from *simulatus* in paler color, with the tail bicolor and the hind feet more extensively white. The skull, though immature, agrees fairly well with adults of *simulatus*.

Specimens examined.—Total number 2, both from the type locality.

PEROMYSCUS GUATEMALENSIS Merriam.

(Pl. V, fig. 2.)

Peromyscus guatemalensis Merriam, Proc. Biol. Soc. Wash., XII, p. 118, Apr. 30, 1898.

Type locality.—Todos Santos, Guatemala. Altitude 10,000 feet.

Geographic distribution.—High altitudes in western Guatemala and southern Chiapas. (See fig. 5, p. 161.)

Characters.—Size about as in *megalops*, larger than *mexicanus* or *furvus*, but smaller than *zarhynchus;* tail longer than head and body, scantily haired, usually evenly bicolor, but sometimes irregularly blotchy below or rarely uniform dusky; pelage very long and lax; color very dark; skull with frontals constricted and without definite supraorbital bead.

Color.—Unworn pelage: Upperparts chiefly pale cinnamon rufous, liberally mixed with dusky, the latter considerably concentrated on dorsum, forming an ill-defined stripe from shoulders to base of tail; general effect of sides russet, becoming Prout brown and nearly black toward middle of back; lateral line scarcely differentiated; a broad area from base of whiskers to and around eye and nearly to base of ear very dark, nearly pure black; tuft of soft hairs at anterior base of ear also nearly black; tip of nose grayish white; ears brownish, very lightly margined with whitish; underparts buffy white, considerably modified by slaty under color; pectoral and axillary regions usually broadly cinnamon rufous; entire underparts, except chin and throat, sometimes suffused with cinnamon rufous; fore feet white; forearm brownish black nearly to carpal joint; hind feet chiefly white, tarsal joint dusky brownish, this often extending over median upper side of hind foot halfway to base of toes; tail usually bicolor, underside frequently irregularly blotched, dusky and yellowish; entire tail occasionally dusky. Worn pelage: General effect of upperparts russet to Mars brown and Prout brown; subterminal zone of color very narrow, allowing much of the slaty under color to appear; underparts buffy white, much modified by slaty.

Skull.—Similar to that of *mexicanus* but larger and broader with larger teeth and audital bullæ; nasals quite elongate; frontals constricted and slightly sharp-angled but not distinctly beaded; braincase rather large and full, decidedly broader than in *mexicanus*. Size, audital bullæ, and teeth about as in *auritus*, but frontals more constricted and without supraorbital bead.

Measurements.—Average of 10 adult topotypes: Total length 267 (252–290); tail vertebræ 138 (132–153); hind foot 30.7 (30–32); ear from notch (dry) 20.6 (20–21.5).

Type specimen.—No. 76861 U. S. National Museum, Biological Survey Collection. ♂ adult. Dec. 31, 1895. E. W. Nelson and E. A. Goldman. Specimen in good condition.

Remarks.—*P. guatemalensis* appears to be most closely related to *P. furvus* and *P. nudipes*, both of which are somewhat smaller. It may be distinguished from *megalops* and *auritus* by its dark color, 'woolly' pelage, and unbeaded skull. From all other species, its size distinguishes it. It averages slightly larger than *auritus* and occasionally attains the size of smaller individuals of *zarhynchus*. There is some cranial variation in the comparatively small series examined.

Specimens from Pinabete are rather robust and their skulls have unusually heavy rostrums. Others from Volcan Santa Maria have relatively large teeth. The relationship of *guatemalensis* to the smaller and more uniformly black-tailed species *nudipes* is not remote, and it is quite possible that intergradation between them may be found when specimens from the mountains of Nicaragua are obtained.

Specimens examined.—Total number 59, from localities as follows:

Chiapas: Pinabete, 8; Volcan de Tacama, 1.
Guatemala: Calel, 21; Todos Santos, 8; Volcan Santa Maria, 11; Zunil, 10.

PEROMYSCUS NUDIPES (ALLEN).

Hesperomys (*Vesperimus?*) *nudipes* Allen, Bull. Am. Mus. Nat. Hist., N. Y., III, pp. 213–214, Apr. 17, 1891.

Peromyscus nudipes Thomas, Ann. & Mag. Nat. Hist., ser. 6, XIV, p. 365, Nov., 1894.

Peromyscus cacabatus Bangs, Bull. Mus. Comp. Zool., XXXIX, pp. 29–30, figs. 8–10, Apr., 1892.

Peromyscus nudipes Allen, *supra cit.*, XX, pp. 67–68, Feb. 29, 1904.

Type locality.—La Carpintera, Costa Rica.

Geographic distribution.—Mountains of central Costa Rica and thence south to Chiriqui.

Characters.—Similar in general to *guatemalensis* but slightly smaller; slightly larger than *mexicanus;* color very dark; pelage full and soft; ears relatively small, nearly naked; tail scaly with very short hairs, nearly unicolor; soles of hind feet narrowly naked medially; skull similar to that of *guatemalensis* but averaging smaller and narrower.

Color.—Unworn pelage: Much as in *guatemalensis*, but more fulvous; sides chiefly russet to Mars brown, quite in contrast to back, which is much more mixed with dusky, forming a broad blackish brown area from shoulders to base of tail; lateral line dark ochraceous buff, slightly contrasted with upper sides; underparts yellowish white with a broad pectoral spot of ochraceous buff, this sometimes quite produced posteriorly or even suffusing entire underparts except chin and throat; fore feet white, forearm dusky nearly to wrist; hind feet white usually with the broad dusky brownish marking on tarsal joint extended on upper side of foot about halfway to base of toes; tail usually unicolor brownish black, but occasionally with the scaly part of the under side slightly blotched with yellowish white.

Skull.—Similar to that of *guatemalensis* but slightly smaller; braincase narrower; nasals slightly broader; audital bullæ smaller; supraorbital border occasionally with a faint suggestion of a bead near fronto-parietal suture; palatine slits widely open; zygomata slightly or scarcely at all notched anteriorly; quite similar to that of *mexicanus* but teeth decidedly larger.

Measurements.—Average of 6 adults from Volcan Irazu, Costa Rica: Total length, 261 (250–280); tail vertebræ, 130 (121–135); hind foot, 28.6 (26–30); ear from notch (dry), 19.1 (18.4–19.4).

Type specimen.—No. $\frac{3643}{2798}$ American Museum of Natural History, New York. ♀ adult. October, 1890. George K. Cherrie. Specimen in alcohol except skull, which has been removed and numbered. It bears a recent type label and an old label the data on which are illegible. The skull is broken across the frontals into two parts, but most of the parts important for comparison are present.

Remarks.—In some ways this species may be said to be intermediate between *guatemalensis* and *mexicanus*. The most obvious character distinguishing it from both of these is its uniformly blackish tail. Occasional specimens show traces of white on the under side of the tail, and the known variability of this character in other species makes it not altogether reliable. The skull of *nudipes* is slightly smaller than that of *guatemalensis* but otherwise agrees very closely. It is about the size and often nearly the form of that of *mexicanus*, but usually there is less suggestion of supraorbital bead and the teeth are larger.

Specimens examined.—Total number 131, from localities as follows:

Chiriqui: Boquete, 89.
Costa Rica: Azala, Cartago, 1; Carpintera, 1; El Coronel de Carrillo, 4; near Jiminez, 1; Juan Vinos, 4; La Estrella, Cartago, 1; near San José, 1; Volcan Irazu, 29.

PEROMYSCUS FURVUS ALLEN AND CHAPMAN.

(Pl. V, fig. 7.)

Peromyscus furvus Allen and Chapman, Bull. Am. Mus. Nat. Hist., N. Y., IX, pp. 201–203, June 16, 1897.

Type locality.—Jalapa, Veracruz, Mexico. Altitude 4,400 feet.

Geographic distribution.—Known from a few localities in humid tropical parts of northern Veracruz and Puebla. (See fig. 5, p. 161.)

Characters.—Size slightly larger than in *mexicanus* (hind foot 29–32) but smaller than in *guatemalensis*; color very dark; ears relatively small, nearly naked; tail slightly longer than head and body, very thinly haired, blackish all around or with slight irregular light markings on scaly part of under side; soles of hind feet naked medially to calcaneum; skull in adult with nasals widely expanded anteriorly.

Color.—Slightly worn pelage: General effect of upperparts dark mummy brown, more blackish on dorsum and more russet on sides, but dorsal area not well defined; a slight suggestion of a lateral line russet; sides of face brownish sepia and blackish, the blackish surrounding the eye and dominating the area from the base of the whiskers to the base of the ear; underparts including pectoral region grayish white considerably modified by slaty undercolor; forearm blackish brown nearly to carpal joint; fore feet white; hind feet white with a broad blackish brown marking on tarsal joint, this occasionally extended for some distance on upper side of hind foot; tail unicolor, blackish all around, or irregularly bicolor, the scaly part of the underside being somewhat blotched with yellowish white. Unworn pelage? (No. 108546): General effect of sides brownish sepia; middle of back nearly pure black, lightly sprinkled with brownish.

Skull.—Size slightly larger than in *mexicanus*, smaller than in *guatemalensis;* frontals quite constricted and without any bead though the posterior part of the supraorbital border may be slightly sharp-angled; zygomata slightly or not at all notched anteriorly; teeth and audital bullæ moderate, slightly larger than in *mexicanus* and relatively about same size as in *guatemalensis;* nasals long, compressed posteriorly and exceeding ascending branches of premaxillæ, greatly expanded in adults anteriorly; premaxillæ correspondingly expanded anteriorly.

Measurements.—Average of 14 topotypes (males): Total length, 263 (248–282); tail vertebræ, 131 (123–145); hind foot, 27.9 (26–29); ear, 21.9 (20–23). Of an adult from Huachinango, Puebla: 267; 142; 32.

Type specimen.—No. $\frac{12450a}{10769}$ American Museum of Natural History, New York. ♂ adult. Apr. 2, 1897. F. M. Chapman. Specimen in good condition; tip of tail very slightly injured.

Remarks.—The widely expanded 'bell-shaped' nasals of this species are quite diagnostic, but do not develop until the animal is thoroughly mature. Even in young specimens, however, the nasals are decidedly cuneate posteriorly, and this in connection with the absence of any suggestion of a supraorbital bead and the very dark color of the pelage suffices to distinguish specimens of any age. The closest affinities of *furvus* seem to be with *guatemalensis*, although, save for its very dark color, it has much the general appearance of *mexicanus*.

Specimens examined.—Total number 32, from localities, as follows:

Puebla: Huachinango, 2.
Veracruz: Jalapa, 28; Jico, 2.

PEROMYSCUS ALTILANEUS Osgood.

Peromyscus altilaneus Osgood, Proc. Biol. Soc. Wash., XVII, pp. 74, 75, Mar. 21, 1904.

Type locality.—Todos Santos, Guatemala. Altitude 10,000 feet.

Geographic distribution.—Known only from the type locality.

Characters.—Similar to *P. melanocarpus*, but smaller and with shorter and less hairy tail; fore feet entirely white; hind feet with much more white than in *melanocarpus;* skull slightly smaller and more slender; similar to that of *guatemalensis* but much smaller.

Color.—Very dark as in *melanocarpus*, but tail blotched with yellowish white below, much as in *mexicanus;* fore feet and part of forearm white; hind foot with a V-shaped dusky mark extending about halfway to the base of the toes, remainder of foot white; pectoral spot strongly developed.

Skull.—Similar to that of *melanocarpus*, but slightly smaller throughout; nasals relatively more expanded anteriorly; braincase slightly higher and more inflated and rostral region more depressed; anterior palatine foramina shorter; infraorbital plate very narrow; supraorbital bead slight; very similar to that of *guatemalensis* but decidedly smaller; similar to that of *mexicanus*, but smaller with a more depressed rostrum and a narrower infraorbital lamina.

Measurements.—Type: Total length, 228; tail vertebræ, 115; hind foot, 28; ear from notch (dry), 20.6.

Type specimen.—No. 76856 U. S. National Museum, Biological Survey Collection. ♂ adult. Dec. 30, 1895. E. W. Nelson and E. A. Goldman. Specimen in good condition.

Remarks.—This species is about the size of *melanocarpus* and is similar also in color except in extent of dusky on the feet. However, a close study of the skulls seems to indicate that *melanocarpus* is most closely related to *megalops*, while *altilaneus* is more similar to *guatemalensis* and *mexicanus*. In fact, scarcely any character can be found distinguishing it from *guatemalensis* except that of size. The type skull, that of an adult male, is so much smaller throughout than in typical *guatemalensis* that it seems hardly possible that it is merely an abnormally small individual of that species. The color and character of the pelage, however, are exactly as in *guatemalensis*.

Specimen examined.—One, the type.

Key to subspecies of Peromyscus mexicanus.

- Size smaller; hind foot 23–24. Parts of Chiapas and Guatemala---------*P. m. gymnotis*
- Size larger; hind foot 26–29.
  - Size very large; total length 244–268; hind foot usually more than 28; color usually very dark --*P. m. totontepecus*
  - Size smaller; total length 233–258; hind foot usually not more than 28.
    - Color darker; rostrum and nasals heavier. Tabasco------------*P. m. teapensis*
    - Color not so dark; rostrum and nasals not so heavy.
      - Audital bullæ averaging larger. Chiapas, Guatemala, and Nicaragua. *P. m. saxatilis*
      - Audital bullæ averaging smaller. Chiapas to northern Puebla. *P. mexicanus*

PEROMYSCUS MEXICANUS (SAUSSURE).

(Pl. V, fig. 8; Pl. VII, fig. 6.)

Hesperomys mexicanus Saussure, Rev. et Mag. de Zool., Paris, XII, pp. 103–105, pl. IX, figs. 1, 1a, Mar., 1860.

P[eromyscus] mexicanus Thomas, Ann. & Mag. Nat. Hist., ser. 6, XIV, p. 364, Nov., 1894.

Peromyscus tehuantepecus Merriam, Proc. Biol. Soc. Wash., XII, p. 122, Apr. 30, 1898.—Tehuantepec, Oaxaca.

Type locality.—Mexico; assumed to be the vicinity of Mirador, Veracruz.[a]

Geographic distribution.—Tropical parts of eastern and southern Mexico from northern Puebla southward to southern Veracruz and thence south and east to southern Oaxaca and northern Chiapas.

Characters.—Size medium, about as in *oaxacensis*, decidedly smaller than in *megalops* and *guatemalensis;* tail slightly longer than head and body, rather coarsely annulated (about 17 annulations per cm.) and clothed with very short scarcely obvious hairs; tail seldom evenly bicolor but usually blotched irregularly on the underside with yellowish white; ears moderate, very thinly haired; proximal fourth of sole of hind foot usually hairy; pelage soft but rather short; skull with relatively small molars and audital bullæ.

Color.—Unworn pelage: Upperparts cinnamon rufous mixed with dusky; middle of back darker than sides, but dusky chiefly disposed in fine lines and always somewhat mixed with rufescent; general effect of sides from cheeks to flanks bright russet; top of head and shoulders like back or slightly paler; spot at base of whiskers and broad orbital ring blackish brown; underparts creamy white, with or without a cinnamon rufous pectoral marking; ears dusky brownish faintly edged with whitish; fore feet and carpal joints white; proximal half of forearm dusky overlaid by rufescent; hind feet white, tarsal joints broadly dusky brownish; hairs of tail dusky above, dull white below; scaly part of tail dusky above, chiefly yellowish below, irregularly blotched with dusky.

Worn pelage: Upperparts varying from ochraceous buff to tawny mixed with darker; general effect varying from dark clay color to russet; middle of back usually much like sides, sometimes darker, approaching Mars brown and Prout brown; dusky facial markings much reduced in area; underparts variously modified by slaty undercolor.

Adolescent pelage: Upperparts and sides pale cinnamon fawn, uniformly mixed with dusky, producing a general effect varying from wood brown to broccoli brown; a narrow lateral line of dark ochraceous buff usually evident; dusky orbital ring narrow, and surrounding part of face slightly grayish.

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[a] The original description states that this species "Habite les mêmes régions que les précédents." "Les précédents" are *H. toltecus* (= *Sigmodon toltecus*) and *H. fulvescens* (= *Oryzomys fulvescens*), the first of which "Habite la Cordillère de la province de Véra-Cruz," and the second "Habite le Mexique." The description following that of *mexicanus* is that of *H. aztecus* (= *Peromyscus aztecus*), which is said to inhabit the "Même patrie que les précédents." It is evident, therefore, that Saussure did not intend to make any fine distinctions as to locality, but wished to indicate merely that all his material came from eastern Mexico. We are justified, then, in assuming that *mexicanus* probably came from the vicinity of Mirador, Veracruz, as Saussure is known to have stopped near there at the Sartorius ranch.

Young in first coat: Upperparts nearly uniform mouse gray, sometimes paler; nearly smoke gray on sides and shoulders; and darker, nearly brownish slate gray, on dorsum.

Skull.—Size medium, smaller than in *megalops* and *guatemalensis*, about equal to or slightly larger than in *oaxacensis* and *hylocetes;* rostrum and nasals moderately long; braincase usually full and deep but not very wide; frontals rather narrow, supraorbital borders sharp-angled, often with a slight bead, this usually confined to the vicinity of the fronto-parietal suture; interparietal large; zygoma strong, usually becoming decidedly notched anteriorly in adults; molar teeth and audital bullæ relatively very small; interpterygoid fossa extending anteriorly a trifle beyond plane of last molar.

Measurements.—Average of four adults from Mirador, Veracruz: Total length, 246 (235–254); tail vertebræ, 128 (118–133); hind foot, 26.6 (26–27); ear from notch (dry), 19 (17.7–20.5). Of four adults from Tehuantepec, Oaxaca: 248.5; 127; 27.

Type specimen.—In the original description of this species, Saussure specifically mentions two specimens and gives their measurements. One of these is mounted in the Geneva Museum and was examined some years ago by Doctor Merriam, who made the following notes on it and has kindly allowed their use in the present publication:

> "No. $\frac{510}{93}$" (marked also in pencil "No. 3") Mexico. Evidently the type of Saussure's description and the specimen whose measurements he gave in the first column (p. 104). Size large; ears large; tail long and scant haired, not distinctly bicolor. Hind foot 26. Ear from crown 15. Tail 106 in the mounted specimen, the extreme tip broken off. Whiskers long, reaching shoulder. Texture of pelage having a velvety appearance somewhat resembling that of *Didelphis murina.* Color: Upperparts dark brown, palest on the flanks and cheeks, which parts are washed with pale ochraceous buff. Viewed from behind the dark brown of the back and shoulders seems lighter and has something of a hoary appearance. Just in front of the forelegs a faint fulvous wash extends over the sides of the breast. It is probable that the colors have undergone some change from museum exposure. Ankles in front and on outside dark brown, this color extending out on the upper surface of the feet more than half way to the toes; rest of hind feet and toes white. Fore feet and wrists white, the brown color of the leg ending abruptly about 2 mm. above the wrist in front on the inner side, and 6 mm. above on the outer side. There is a little rusty about the nose.

The skull of this specimen was not submitted to Doctor Merriam with Saussure's material, but it may be preserved still in the Geneva Museum, and possibly it is the one of which the teeth were figured with the original description.

Remarks.—*P. mexicanus* and its subspecies are readily distinguishable from nearly all other species by the character of the tail, which is very irregularly bicolor and with the scaly annulations scarcely at all concealed by hair. Certain larger species, as *guatemalensis*, sometimes have irregularly blotched tails, but their size precludes the possibility of their being confused with *mexicanus*. The tail is not always evenly bicolor in *banderanus* and *yucatanicus*, but these forms are well characterized otherwise, *banderanus* by its beaded skull and *yucatanicus* by its small size. The subspecies of *mexicanus* are very slightly characterized and perhaps but recently developed from a common stock. They can not consistently be 'lumped,' but it must be said that there is much variation throughout the group and that none of the characters of the several subspecies are absolutely constant. Certain average characters, however, are to be found, and certain extremes of differentiation are fairly marked. The variation in cranial characters is very great, and every considerable series examined has shown some deviations from the general type. It is difficult to associate any two series on the basis of common peculiarities. In view of this variation it does not seem possible to recognize a form under the name '*tehuantepecus*.' The small series from Tehuantepec are chiefly in worn pelage and in color do not differ from similarly worn specimens from localities in Veracruz near the type locality of *mexicanus*. Although the interparietal averages large in the few skulls from Tehuantepec, it does not seem to be a subspecific character, for equally large interparietals may be found in almost any series; in fact, the most nearly perfect skull from Mirador, the type locality of *mexicanus*, has the interparietal slightly larger than that of the type of '*tehuantepecus*.' In regard to color there is also much variation, perhaps of an 'ontogenetic' nature. Specimens from more humid localities are usually darker than those from more arid parts, but this does not seem to be correlated with definite areas. It is even conceivable that unusual darkness of color may be produced by an unusually wet season in a normally arid region.

Specimens examined.—Total number 182, from localities as follows:

Chiapas: Mountains near Tonala, 8; Ocozucuautla, 4; Ocuilapa, 2; Valley of Jiquipilas, 4.

Oaxaca: Agua Frio, 7; Lagunas, 3; near Tehuantepec, 5; Santa Efigenia, 13.

Puebla: Metlaltoyuca, 7.

Veracruz: Achotal, 19; Carrizal, 9; Catemaco, 5; Jico, 12; Lagunas, 6; Mirador, 4; Otatitlan, 4; Papantla, 13; Pasa Nueva, 8; San Andres Tuxtla, 4; San Carlos, 12; Santiago Tuxtla, 9; Teocelo, 2 (approaching *totontepecus*); Texolo, 16; Volcan Tuxtla, 6 (approaching *totontepecus*?).

PEROMYSCUS MEXICANUS TOTONTEPECUS Merriam.

Peromyscus mexicanus totontepecus Merriam, Proc. Biol. Soc. Wash., XII, pp. 120–121, Apr. 30, 1898.

Peromyscus mexicanus orizabae Merriam, *supra cit.*, pp. 121–122.—Orizaba, Veracruz, Mexico.

Type locality.—Totontepec, Oaxaca, Mexico. Altitude, 6,000 feet.

Geographic distribution.—Western Veracruz and east central Oaxaca west of the range of *P. mexicanus.*

Characters.—Similar to *P. mexicanus*, but larger and averaging decidedly darker; skull larger and molar teeth heavier.

Color.—Similar to that of *mexicanus*, but darker throughout; general effect of back Prout brown nearly to black; general effect of sides cinnamon rufous to chestnut; dusky markings accentuated, those on the tarsal joints extending from one-third to one-half the length of the upper side of the hind foot; pectoral spot more frequently and more extensively developed than in *mexicanus;* entire underparts often suffused with rufescent.

Skull.—Similar to that of *mexicanus*, but averaging larger; molar teeth larger and broader.

Measurements.—Average of 5 adult topotypes: Total length, 257 (244–268); tail vertebræ, 131 (124–136); hind foot, 28.2 (28–29); ear from notch (dry), 16.9 (16–17.8). Average of 10 adults from Orizaba, Veracruz: 254 (238–269); 134 (122–142); 28.6 (28–29.5).

Type specimen.—No. 68624 U. S. National Museum, Biological Survey Collection. ♀ adult. July 16, 1894. E. W. Nelson and E. A. Goldman. Specimen in good condition; skull with slightly broken basioccipital.

Remarks.—This form is distinguished from *mexicanus* and the others of the group chiefly by its large size. It is also very dark colored, but is nearly equaled in this respect by *teapensis*, though quite decidedly darker than *mexicanus* or *saxatilis.* Skulls from Totontepec do not show such heavy and deeply notched zygomata as those from Orizaba, but after considering the entire *mexicanus* group, it appears that this and other peculiarities found in small series from various localities are due to age or individual variation. The dark color, large size, heavy skull, and relatively broad molars seem to be the only characters common to series from more than one locality, and therefore the series with these associated characters have been recognized under the name *totontepecus* without regard to the peculiarities of individual series which are not constant and are found sporadically throughout the group. The apparent tendency of the series from Orizaba to heavy notched zygomata may be indication of a leaning towards *mexicanus*, for the best available adult skull of typical *mexicanus* from Mirador shows exactly this type of zygoma. It is strange that these Orizaba specimens should differ at all from those of *mexicanus*, for the locality is on the same mountain slope but a short distance from Mirador.

Specimens examined.—Total number 71, from localities as follows:

Oaxaca: Choapam, 1;[a] Comaltepec, 2; Guichicovi, 8;[a] mountains near Santo Domingo, 6;[a] Santo Domingo, 13;[a] Totontepec, 10.
Veracruz: Motzorongo, 11; Orizaba, 20.[a]

PEROMYSCUS MEXICANUS SAXATILIS MERRIAM.

Peromyscus mexicanus saxatilis Merriam, Proc. Biol. Soc. Wash., XII, p. 121, Apr. 30, 1898.

Peromyscus nicaraguae Allen, Bull. Am. Mus. Nat. Hist., XXIV, pp. 649–650, Oct. 13, 1908.—Matagalpa, Nicaragua.

Type locality.—Jacaltenango, Huehuetenango, Guatemala. Altitude, 5,400 feet.

Geographic distribution.—Northwestern Guatemala and southeastern Chiapas, south to Nicaragua.

Characters.—Very similar to *mexicanus;* color practically identical; skull with slightly larger audital bullæ.

Color.—As in *mexicanus.*

Skull.—Similar to that of *mexicanus;* braincase averaging broader and fuller; frontals wider with slightly less tendency to the formation of a supraorbital bead; audital bullæ larger.

Measurements.—Average of 10 adult topotypes: Total length, 224 (233–258); tail vertebræ, 127 (120–138); hind foot, 27.6 (27–29); ear from notch (dry), 18.2 (16.6–19.5).

Type specimen.—No. 77296 U. S. National Museum, Biological Survey Collection. ♂ adult. Dec. 19, 1905. E. W. Nelson and E. A. Goldman. Specimen in good condition. Size abnormally small.

Remarks.—The only character of consequence by which to separate this form from *mexicanus* is the size of the audital bullæ, and even this is not absolutely constant. As an average character, however, it seems to prevail throughout a considerable number of specimens from several localities. The recognition of this form makes it even more imperative to place '*tehuantepecus*' in synonymy, for it seems that the Tehuantepec specimens are intermediate between *mexicanus* and *saxatilis* in much the same way that Orizaba specimens fall between *mexicanus* and *totontepecus.* In color *saxatilis* seems to be exactly like *mexicanus.* The series from Jacaltenango are in unworn pelage exactly like specimens in the same pelage from Mirador. The worn pelage is shown by specimens from Canjob and San Bartolomé, which agree with equally worn specimens of *mexicanus* from localities in Veracruz. The type of *saxatilis* is unusually small, the skull and teeth being particularly small and light as compared with those of the large series of topotypes.

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[a] Approaching *mexicanus.*

Specimens examined.—Total number 96, from localities as follows:

Chiapas: Canjob, 16; Chicharras, 20 (approaching *gymnotis?*); San Bartolomé, 7; San Vicente, 1; Tuxtla Gutierrez, 4.
Guatemala: Jacaltenango, 34; Nenton, 4.
Nicaragua: Chontales, 3; Matagalpa, 5; San Rafael del Norte, 2.

PEROMYSCUS MEXICANUS TEAPENSIS Osgood.

Peromyscus mexicanus teapensis Osgood, Proc. Biol. Soc. Wash., XVII, pp. 69–70, Mar. 21, 1904.

Type locality.—Teapa, Tabasco, Mexico. Altitude 800 feet.

Geographic distribution.—Humid tropical parts of northern Tabasco, Mexico.

Characters.—Similar to *P. m. totontepecus*, but sides brighter and more contrasted with dark area in middle of back; skull with thicker, heavier rostral region.

Color.—Type: Sides rich chestnut, shading into a well-defined blackish area in median dorsal region; a narrow black orbital ring and spot at base of whiskers; underparts slate color overlaid with creamy white (no pectoral spot in type, but of frequent occurrence among series of topotypes); tail black with the exception of a few irregular spots of yellowish white on under side; fore feet white; hind feet white except a dark brown area extending with decreasing width from 'ankles' down nearly to base of toes.

Skull.—Similar to that of *totontepecus*, but with broader nasals and generally heavier and more thickened rostral region; anterior palatine foramina usually wider; infraorbital part of zygomata rather heavy but not squarely 'elbowed'; teeth about as in *totontepecus*, wider and heavier than in *mexicanus*.

Measurements.—Average of 10 adults from the type locality: Total length, 245 (234–254); tail vertebræ, 129 (121–136); hind foot, 28 (27–28.5).

Type specimen.—No. 100022 U. S. National Museum, Biological Survey Collection. ♀ adult. March 25, 1900. E. W. Nelson and E. A. Goldman. Specimen in good condition.

Remarks.—The thickened rostrum and anteriorly expanded nasals of this form approach the condition found in *P. furvus*, but the development is not so extreme as in that species. As in *furvus*, the characters are not well developed except in fully adult specimens. The vicinity of Teapa, visited by Nelson and Goldman in the spring of 1900, is not far above sea level, and is now well known for the dark rich color of its animals. The present subspecies is not an exception. Its color is not so extensively blackish as in *totontepecus*, but the rufescent shades equal in richness anything found elsewhere in the *mexicanus* group.

Specimens examined.—Total number 21, from localities as follows:

Tabasco: Near El Salto, 2; Montecristo, 2; Teapa, 17.

PEROMYSCUS MEXICANUS GYMNOTIS THOMAS.

Peromyscus gymnotis Thomas, Ann. & Mag. Nat. Hist., Lond., ser. 6, XIV, pp. 365–366, Nov., 1894.

Type locality.—Guatemala.

Geographic distribution.—Certain parts of Guatemala and (probably) northward at slight elevations to southwestern Chiapas.

Characters.—Similar to *P. mexicanus*, but smaller (hind foot 23–25); tail about equal to or slightly shorter than head and body, scaly annulations slightly finer than in *mexicanus* and clothed with even shorter hairs; tail nearly unicolor or with slight blotches of yellowish on under side; ears moderate, very scantily haired.

Color.—No. 77659: Upperparts chiefly rich tawny ochraceous, almost as in *P. aztecus*, except that there is very little black in the mid-dorsal region; underparts dull buffy white with slaty undercolor showing through, pectoral region suffused with fulvous; head, feet, and ears about as in *mexicanus;* scaly part of tail dusky blackish all around except some slight blotches of yellowish white on proximal half of under side. Two additional specimens in worn pelage: Back dark mummy brown with thin patchy areas of ochraceous on the sides.

Skull.—Similar to that of *mexicanus* but smaller, about the size of that of *P. aztecus;* premaxillæ rather swollen laterally; nasals decidedly convex; zygomata depressed anteriorly considerably below plane of rostrum; supraorbital border with a very slight suggestion of a bead; teeth and audital bullæ small.

Measurements.—Type and two adults from Huehuetan, Chiapas, respectively: Total length, 191; 217; 220; tail vertebræ, 92; 104; 110; hind foot, 23; 25; 24; ear from notch, 17; 16.5 (dry); 15 (dry).

Type specimen.—No. 86.5.13.4 British Museum. "Coll. Bernoulli." Specimen in alcohol in fair condition.

Remarks.—The above description is based chiefly on three specimens from Huehuetan, Chiapas, which are believed to be very similar to the type of *P. gymnotis*. Two of these specimens (Nos. 77658 and 77659) were sent to the British Museum in the summer of 1905 and there compared by G. S. Miller, jr.,[a] with the type of *gymnotis*. Mr. Miller's notes on the type are as follows:

> Color of type injured by alcohol—a peculiar indefinite gray brown above, suggesting immaturity—underparts between buff and Isabella color—no pectoral spot visible. Tail of type more finely ringed than in any of these, 22 rings to the centimeter at middle and without trace of lighter color below—haired as

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[a] Since the above was written I also have examined this type, but can form no more positive conclusions regarding it than those here stated.

in Nos. 77658—ears as in 77658–9. The animal is close to these (judging by externals) and not at all like 77309 [*saxatilis*], which is much too large and with bicolor tail.

In spite of this fairly close agreement there are some discrepancies, and it is quite possible that additional collecting in Guatemala may prove either that *gymnotis* is the same as *allophylus* or a species not yet represented in American collections. For the present it seems best to associate the name *gymnotis* with the specimens from Huehuetan rather than to add another name to a difficult group already overburdened. The essential part of the original description of *gymnotis* is as follows:

> Size medium; ears long, tail short. General color, so far as can be made out in a spirit-specimen, very dark, almost bistre-brown. Under surface dirty buff, the slate-colored bases of the hairs showing through. Ears long, laid forward in a spirit-specimen they reach 3 or 4 millim. in front of the anterior canthus of the eye; perfectly naked, no hairs being discernible upon them (except at their bases posteriorly) even with a lens;[1] their substance plumbeous in color. Palate ridges 3–5. Hands and feet thinly covered with fine silvery-white hairs; fifth hind toe reaching to the base of the second phalanx of the fourth; soles practically naked along median line, a few scattered white hairs being only found on this part. Tail slightly shorter than the head and body, slender, very thinly clothed with minute brown hairs, which are everywhere of the same color, while the skin of the tail itself is also dark brown above and below for its whole length.
>
> Skull, as compared to that of *P. aztecus*, decidedly more lightly built and flatter above when viewed in profile; muzzle longer and narrower; supraorbital edges square but not beaded; palatal foramina widely open; bullæ rather smaller. Dimensions of the type (an adult male in spirit): Head and body 99 millim.; tail 92; hind foot 22 (with claws 23); ear 17 x 13.5; heel to front of last footpad 10.

Specimens examined.—Total number 4, from localities as follows:

Chiapas: Huehuetan, 3.
Guatemala: Guatemala, 1 (type).

PEROMYSCUS ALLOPHYLUS Osgood.

Peromyscus allophylus Osgood, Proc. Biol. Soc. Wash., XVII, p. 71, Mar. 21, 1904.

Type locality.—Huehuetan, Chiapas, Mexico. Altitude 200 feet.

Geographic distribution.—Known only from the type locality.

Characters.—Size medium (hind foot 25); tail shorter than head and body; ears moderate, scantily haired; coloration dark; tail dusky blackish, unicolor, covered with small imbricate scales, much as in *Oryzomys;* proximal third of soles of hind feet finely haired; skull rather long and narrow; teeth very small.

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[1] "A second examination with a more powerful lens shows that there are a few widely scattered minute whitish hairs on the ears, but they are so few and so small as practically not to affect the statement in the text."

Color.—General effect of sides mummy brown, deepening toward middle of back, causing a rather distinct median dorsal line of blackish brown; underparts yellowish white over slate-color, the latter showing through; tail dusky blackish, unicolor; a black orbital ring and antorbital spot; feet whitish, scantily haired; 'ankles' dusky.

Skull.—Rather long and narrow; braincase elevated; infraorbital notch scarcely evident; nasals rather short, slightly exceeded by premaxillæ; no supraorbital ridge; palatine foramina rather large, longer than bony palate; audital bullæ small, smaller than in *aztecus* or *mexicanus* and having a marked flange on anterior flattened production; molar teeth very small; interparietal small; frontals rather wide; supraorbital border sharp-angled but not beaded.

Measurements.—Type: Total length, 202; tail vertebræ, 95; hind foot, 25; ear from notch (dry), 17.

Type specimen.—No. 77657 U. S. National Museum, Biological Survey Collection. ♀ adult. Feb. 21, 1896. E. W. Nelson and E. A. Goldman. Specimen in good condition.

Remarks.—It is difficult to be certain of the affinities of this peculiar species. But for the size of its ears and shortness of its tail it might well pass for an *Oryzomys* of the *O. chapmani* group. Its dark scaly tail suggests *Oryzomys*, and the character and color of its pelage bear out the resemblance. Its skull, however, is that of the ordinary type of *Peromyscus*. Its closest relationship is probably with the *mexicanus* group, though it may be a northern member of a Central American group not yet known as such. It agrees in some respects with the description of *P. gymnotis* Thomas from Guatemala, but without direct comparison it is difficult to determine whether or not it is that species.

Specimen examined.—One, the type.

Key to Subspecies of Peromyscus banderanus.

Skull with supraorbital beads slight or obsolete	*P. b. angelensis*
Skull with supraorbital beads well developed.	
Color paler, chiefly ochraceous buff with very little dusky mixture	*P. banderanus*
Color darker, usually with considerable mixture of dusky	*P. b. vicinior*

PEROMYSCUS BANDERANUS Allen.

(Pl. V, fig. 1.)

Peromyscus banderanus Allen, Bull. Am. Mus. Nat. Hist., N. Y., IX, p. 51, Mar. 15, 1897.

Type locality.—Valle de Banderas, Tepic, Jalisco, Mexico.

Geographic distribution.—Pacific coast of Mexico from Bahia Banderas, Tepic, to vicinity of Acapulco, Guerrero.

Characters.—Size medium (hind foot about 25); tail about equal to head and body; ears moderate; pelage soft but rather short; soles of hind feet naked to calcaneum; color chiefly bright ochraceous buff; skull rather elongate and having well-developed supraorbital beads.

Color.—No. $\frac{33308}{46556}$ Hacienda Magdalena, Colima, Mar. 19, pelage very slightly worn: General color of upperparts and sides ochraceous buff, with a very fine mixture of cinnamon nearly uniformly distributed; the color is almost solid ochraceous buff, being merely toned down by the admixture of cinnamon tipped hairs and the effect of the underlying plumbeous; underparts creamy with a broad ochraceous buff pectoral patch; forehead and sides of head mixed cinnamon and drab gray; a buffy spot under eye connecting on its lower side with the main color of the sides; orbital ring and spot at base of whiskers Vandyke brown; feet white with a prominent spot of Prout brown on 'ankles'; hairs of tail dusky above, white below, scaly part of tail sometimes bicolor, but frequently blotched dusky and yellowish. Adolescent, No. 70757, Acapulco, Guerrero: Similar to adult, but general color decidedly paler and more broken up by admixture of dusky tipped hairs with a slight tendency to concentration in median dorsal region. Young: Underfur slate color (Ridgway, Pl. II, No. 4), as in adults; ground color smoke gray with a plentiful mixture of brownish tipped hairs; dusky markings about eyes, whiskers, and 'ankles' well indicated.

Skull.—General outline narrow and elongate; posterior part of braincase elongated to such extent that more than half of the large interparietal lies posterior to a plane passing behind the audital bullæ; supraorbital beads highly developed, forming a trenchant shelf above the orbit and bounded on the inner side by a distinct groove-like channel extending from the lacrymal region up to and often beyond the parieto-frontal suture; lacrymal region swollen; nasals ending slightly anterior to a well-marked interlacrymal pit and almost exactly on the plane of the anterior border of the orbit; audital bullæ rather small (scarcely more than half as large as in *melanophrys*); anterior palatine foramina smaller than in *mexicanus* or *melanophrys*, and usually ending anterior to the plane of the front of the first upper molar; general shape of these foramina usually triangular, being narrowest at the anterior apex and gradually widening to the middle and thence nearly constant to the posterior end; teeth of moderate size, slightly smaller than in *mexicanus* and *melanophrys*.

Measurements.—Average of 5 adults from Hacienda Magdalena, Colima: Total length, 234 (228–245); tail vertebræ, 119 (115–127); hind foot, 25; ear from notch (dry), 18 (17.2–18.5).

Type specimen.—No. $\frac{8387}{6667}$ American Museum of Natural History, New York. ♀ adult. Feb. 23, 1893. A. C. Buller. Skin in good condition, though badly formed, head 'humped,' forelegs turned back, etc. Skull with nasals slightly chipped in front, molar teeth loose and two of them missing; otherwise in good condition.

Remarks.—*P. banderanus* is about the size and proportions of *P. aztecus* and closely related forms, but is much paler in color. Its naked soles distinguish it from this and all other Mexican species of approximate size. Its general combination of characters is unique, so it should not be confused with other species. The naked soles, pale color, and narrow beaded skull easily distinguish it. It is confined to the west coast of Mexico and has but two subspecific representatives, one at the extreme southern end of its range and the other a short distance into the interior to the eastward.

Specimens examined.—Total number 41, from the following localities in Mexico:

Colima: Colima City, 7; Hacienda Magdalena, 9; Hacienda San Antonio, 1; Manzanillo, 7.
Guerrero: Acapulco, 11; El Limon, 2; near Ometepec, 2.
Tepic: Navarretė, 1; Valle de Banderas, 1.

PEROMYSCUS BANDERANUS VICINIOR Osgood.

Peromyscus banderanus vicinior Osgood, Proc. Biol. Soc., Wash., XVII, pp. 68–69, Mar. 21, 1904.

Type locality.—La Salada, Michoacan, Mexico.

Geographic distribution.—Western Mexico in the States of Michoacan and Guerrero, occupying the slightly more elevated region immediately east of the range of typical *banderanus*.

Characters.—Similar to *P. banderanus* but darker, usually with considerable mixture of dusky in color; skull averaging narrower; soles of hind feet naked medially.

Color.—Slightly darker and more vinaceous in worn pelage than in *banderanus;* decidedly darker in winter pelage; ground color ochraceous buff, but with a strong mixture of dusky on back and sides and a slightly differentiated concentration in median dorsal region; nose and sides of face grayish: markings about eyes, whiskers, and tarsal joints sooty instead of brownish; pectoral spot often absent; upper side of tail blackish instead of brownish; otherwise similar to *banderanus.*

Skull.—Similar to that of *banderanus*, but braincase averaging slightly narrower; anterior palatine foramina more nearly elliptical, being widest in the middle and narrowing toward each end; supraorbital beads well developed.

Measurements.—Type: Total length, 216; tail vertebræ, 107; hind foot, 27. Average of three adolescents from La Huacana, Michoacan: 233 (225–240); 117 (115–121); 24.5 (24–25); ear from notch (dry), 16.2 (16–16.5).

Type specimen.—No. 126503 U. S. National Museum, Biological Survey Collection. ♂ adult. March 23, 1903. E. W. Nelson and E. A. Goldman. Specimen in good condition.

Remarks.—This is an interior form of *banderanus* having a narrow range in the slightly elevated region paralleling the coast. In full unworn pelage, as shown by two specimens from Los Reyes, Michoacan, it is decidedly darker than *banderanus*, since the pelage contains a liberal mixture of dusky. The small series from La Salada have uniformly narrow skulls, noticeably narrower than in *banderanus*, but other specimens from Los Reyes and La Huacana indicate that this character is not stable. Whether it is even an average character throughout the range of the form will appear when further material is acquired.

Specimens examined.—Total number 15, from localities as follows:

Guerrero: Acahuizotla, 3.
Michoacan: La Huacana, 4; La Salada, 6; Los Reyes, 2.

PEROMYSCUS BANDERANUS ANGELENSIS OSGOOD.

Peromyscus banderanus angelensis Osgood, Proc. Biol. Soc. Wash., XVII, p. 69, Mar. 21, 1904.

Type locality.—Puerto Angel, Oaxaca, Mexico.

Geographic distribution.—Coast of southern Oaxaca; known from two localities only.

Characters.—Similar to typical *banderanus;* size larger; sole of hind foot narrowly naked medially, but not so obviously so as in *banderanus;* skull larger and heavier; supraorbital bead nearly obsolete instead of well-developed.

Color.—Practically as in *banderanus;* possibly averaging a trifle darker; pectoral spot well-developed and considerably produced posteriorly.

Skull.—Similar in general form to that of *banderanus*, but supraorbital borders much less distinctly or scarcely at all beaded, but reduced to simple shelves much as in *melanophrys* and *mexicanus;* size larger; braincase less elongate; interparietal shorter; nasals longer; molar teeth slightly larger.

Measurements.—Average of 7 adult topotypes: Total length, 235 (222–258); tail vertebræ, 120 (112–128); hind foot, 27 (26.5–28); ear from notch (dry), 17.3 (17–17.7).

Type specimen.—No. 71442 U. S. National Museum, Biological Survey Collection. ♀ adult. March 13, 1895. E. W. Nelson and E. A. Goldman. Specimen in good condition.

Remarks.—The divergence of this form from typical *banderanus* seems to be in the direction of the *mexicanus* group. Its general appearance, character of pelage, nearly naked soles, etc., are as in *banderanus*, but its skull approaches that of *mexicanus* quite closely, differing mainly in its more elongate braincase. Therefore, it would not be surprising if further material should demonstrate connection between *mexicanus* and *banderanus*.

Specimens examined.—Total number 23, from localities as follows:

Oaxaca: Pinotepa, 1; Pluma, 2; Puerto Angel, 20.

Key to Subspecies of Peromyscus yucatanicus.

Color paler, not largely mixed with dusky; median dorsal area usually not differentiated ---------- *P. yucatanicus*

Color darker, with considerable mixture of dusky; dorsal area usually somewhat differentiated ---------- *P. y. badius*

PEROMYSCUS YUCATANICUS ALLEN AND CHAPMAN.

(Pl. V, fig. 4.)

Peromyscus yucatanicus Allen and Chapman, Bull. Am. Mus. Nat. Hist., N. Y., IX, p. 8, Feb. 23, 1897.

Type locality.—Chichenitza, Yucatan, Mexico.

Geographic distribution.—Northern parts of the peninsula of Yucatan; chiefly arid tropical zone.

Characters.—Size medium (hind foot 22–24); tail about equal to or slightly shorter than head and body; ears medium, nearly naked; soles of hind feet hairy proximally; tail thinly haired, scarcely penciled, evenly bicolor or with under side blotchy; skull with slight supraorbital bead, small teeth, and small audital bullæ. Similar in general characters to *P. mexicanus*, but decidedly smaller.

Color.—Slightly worn pelage: Upperparts bright ochraceous buff or ochraceous, lightly and nearly uniformly mixed with dusky; sides about like back; a rather broad lateral line clear ochraceous, only slightly contrasted; a narrow dusky orbital ring; underparts yellowish white, becoming more nearly pure white on throat and chin; pectoral spot rarely present; feet white, tarsal joint slightly marked with pale brownish; hairs of tail dusky above and white below, evenly divided, but scaly annular part of tail dusky above and yellowish white below, variously speckled and blotched with dusky.

Skull.—Size medium; braincase rather elongate; frontals wide and supraorbital border shelflike or slightly beaded; nasals relatively wide, ending about even with posterior endings of premaxillæ; audital bullæ medium or rather small; palatine slits moderately large; teeth relatively very small; zygomata very slightly notched by infraorbital foramina. Similar in general to that of *mexicanus*, but very decidedly smaller throughout.

Measurements.—Average of 10 adults from La Vega, Yucatan: Total length, 216 (208–232); tail vertebræ, 112 (105–122); hind foot, 23.8 (23–26); ear from notch (dry), 17 (15.2–18.3).

Type specimen.—No. $\frac{12001}{10434}$ American Museum of Natural History, New York. ♂ adult. Mar. 17, 1896. Frank M. Chapman. Specimen in good condition.

Remarks.—While apparently quite distinct, this species is little more than a miniature of *P. mexicanus.* In all general characters except size it shows no marked departure from *mexicanus.* Its slightly blotched tail, slightly beaded skull, small teeth, and small audital bullæ readily distinguish it from any species approximating it in size. Its pelage, including the hairiness of the tail, is not so coarse as in *mexicanus*, and in specimens so far examined (all in slightly worn pelage) the color is somewhat brighter, being chiefly bright ochraceous throughout.

Specimens examined.—Total number 35, from localities as follows:

Yucatan: Chichenitza, 8; La Vega, 26; Puerto Morelos, 1.

PEROMYSCUS YUCATANICUS BADIUS Osgood.

Peromyscus yucatanicus badius Osgood, Proc. Biol. Soc. Wash., XVII, pp. 70–71, March 21, 1904.

Type locality.—Apazote, Campeche, Mexico.

Geographic distribution.—Known only from the type locality.

Characters.—Similar to *P. yucatanicus*, but darker colored.

Color.—Decidedly darker than *P. yucatanicus*, having the median dorsal area with a strong admixture of black and more or less black on the sides, except a narrow lateral line which is cinnamon rufous like the general ground color; underparts faintly suffused with yellow; a narrow black orbital ring; hairs of tail blackish brown above, white below; underside of tail beneath hairs chiefly yellowish white, but somewhat irregularly blotched with dusky; feet white.

Skull.—As in *P. yucatanicus.*

Measurements.—Average of 10 topotypes: Total length, 193.4; tail vertebræ, 96.7; hind foot, 23.5; ear from notch (dry), 16.4 (16–16.8).

Type specimen.—No. 108016 U. S. National Museum, Biological Survey Collection. ♀ adult. Dec. 28, 1900. E. W. Nelson and E. A. Goldman. Specimen in good condition.

Remarks.—This slight form doubtless owes its dark color to the character of its habitat, which is in a more humid region than that of true *yucatanicus.* Its range is probably limited to the region of the base of the peninsula of Yucatan, as its nearest relatives known from west of that region are the larger and quite different forms of the *mexicanus* group.

Specimens examined.—Total number 19, all from the type locality.

Key to subspecies of Peromyscus megalops.

Tail uniform blackish all around……………………………………*P. m. melanurus*
Tail evenly bicolor or at least somewhat blotched with yellowish white below.
    Slightly darker; audital bullæ smaller……………………………………*P. megalops*
    Slightly paler; audital bullæ larger……………………………………*P. m. auritus*

PEROMYSCUS MEGALOPS MERRIAM.

(Pl. V, fig. 5.)

Peromyscus megalops Merriam, Proc. Biol. Soc. Wash., XII, p. 119, Apr. 30, 1898.

Type locality.—Mountains near Ozolotepec, Oaxaca, Mexico. Altitude, 10,000 feet.

Geographic distribution.—Known only from the type locality.

Characters—Size large (hind foot 30–31); tail decidedly longer than head and body, coarsely haired, and irregularly bicolor; pelage long and lax; color with more tawny than in *guatemalensis*, much as in *thomasi;* skull with large broad braincase and distinct supraorbital bead.

Color.—Slightly worn pelage: Upperparts mixed tawny and blackish brown; sides chiefly rich tawny but little modified by dusky; broad dorsal area chiefly blackish brown, lightly sprinkled with tawny, producing a general effect approaching the mummy brown of Ridgway; line from base of whiskers to and around eye and thence halfway to base of ear broadly blackish brown; forehead brownish; sides of nose in front of whiskers grayish cinnamon; extreme tip of nose with a tiny whitish spot; underparts pale whitish buff, somewhat modified by undercolor; pectoral and axillary region broadly tawny (usually); feet white; forearm with a narrow dusky line reaching nearly to carpal joint; tarsal joint broadly dusky, and this sometimes slightly extended on upper side of hind foot; hairs of tail usually evenly bicolor, dusky above, whitish below; scaly annular part of tail dusky above and irregularly blotched dusky and yellowish white below.

Skull.—Size large, exceeding that of *mexicanus* and about equaling that of *guatemalensis;* braincase broad; frontals broad, distinctly beaded on supraorbital border and depressed in median line forming a shallow pit immediately behind the nasals; lacrymal region rather swollen; zygomata very slightly notched by infraorbital foramina; nasals rather long, slightly exceeding the ascending branches of the premaxillæ; audital bullæ relatively small; interpterygoid fossa wide and long, extending anteriorly to the plane of the middle of the last molar; palatine slits large and broadly open; teeth moderate, decidedly larger than in *mexicanus*, about as in *guatemalensis*.

Measurements.—Type: Total length, 282; tail vertebræ, 150; hind foot, 31; ear from notch (dry), 19. Average of five topotypes: 278; 147; 31.

Type specimen.—No. 71592 U. S. National Museum, Biological Survey Collection. ♂ old. March 26, 1895. E. W. Nelson and E. A. Goldman. Specimen in good condition, but skull lacking the first upper molar on each side.

Remarks.—This species and its very closely allied subspecies are among the largest members of the restricted genus. They about equal *guatemalensis* in size, and in the subgenus *Peromyscus* are exceeded only by *P. zarhynchus.* They may be distinguished from *guatemalensis* by their more tawny color and by their more distinctly beaded frontals.

Specimens examined.—Total number 5, all from the type locality.

PEROMYSCUS MEGALOPS AURITUS MERRIAM.

Peromyscus auritus Merriam, Proc. Biol. Soc. Wash., XII, pp. 119–120, Apr. 30, 1898.

Peromyscus comptus Merriam, *supra cit.*, p. 120.—Mountains near Chilpancingo, Guerrero.

Type locality.—Mountains 15 miles west of Oaxaca, Oaxaca, Mexico. Altitude 9,300 feet.

Geographic distribution.—High altitudes in mountains of western Oaxaca and southeastern Guerrero, Mexico. (See fig. 5, p. 161.)

Characters.—Very similar to *P. megalops*, but ears possibly slightly larger and color averaging slightly paler; audital bullæ decidedly larger.

Color.—Practically as in *megalops*, but apparently averaging slightly paler. Unworn pelage: General effect of upperparts cinnamon; back only very slightly darker than sides; face with dusky markings subdued by fulvous, only a narrow orbital ring conspicuous; underparts nearly pure creamy white, but slightly modified by undercolor; tail dusky above, white below, scaly part very slightly blotched with dusky on underside. Worn pelage: About as in *megalops;* dark undercolor more exposed on upperparts as well as on underparts; sides of face darker, with dusky markings more pronounced.

Skull.—Similar to that of *megalops*, but audital bullæ decidedly larger; nasals slightly longer.

Measurements.—Type: Total length, 288; tail vertebræ, 148; hind foot, 30.5; ear from notch (dry), 23.3. Average of four topotypes: 281; 148; 31.5. Of ten adults from mountains near Chilpancingo, Guerrero ('*comptus*'): 273; 143; 30.4.

Type specimen.—No. 68438 U. S. National Museum, Biological Survey Collection. ♀ old. Sept. 17, 1894. E. W. Nelson and E. A. Goldman. Specimen in good condition.

Remarks.—In all general characters this form is like *megalops*. Its best distinguishing character is the size of the audital bullæ, which is markedly greater than in *megalops*. The material thus far available in this small group is hardly sufficient for satisfactory conclusions as to slight variations in color. The few specimens of *auritus* from the type locality are in somewhat worn pelage. A considerable series of adults from the mountains near Chilpancingo, Guerrero, are in very full unworn pelage, which appears to be quite decidedly lighter than the worn pelage. Their subspecific separation would seem to be warranted were it not for a series recently obtained from Omilteme, Guerrero, but a few miles away, in which are found slightly worn specimens indistinguishable from the type of *auritus*. The ears appear to be slightly larger than in *megalops*, but with only dry specimens for comparison it is difficult to be certain of the real difference in this respect.

Specimens examined.—Total number 38, from localities as follows:

Guerrero: Mountains near Chilpancingo, 18; Omilteme, 14.
Oaxaca: Mountains 15 miles west of Oaxaca, 6.

PEROMYSCUS MEGALOPS MELANURUS subsp. nov.

Type from Pluma, Oaxaca, Mexico. Altitude, 4,600 feet. No. 71385, U. S. National Museum, Biological Survey Collection. ♂ adult. Mar. 20, 1895. E. W. Nelson and E. A. Goldman.

Geographic distribution.—Known only from the type locality.

Characters.—Similar to *megalops*, but size smaller, pelage much shorter, and skull smaller and more stoutly built; tail nearly unicolor, blackish above and below. Size and general appearance about as in *mexicanus*, but skull with broader and more distinctly beaded frontals.

Color.—Worn pelage: Extremely variable, running from Mars brown to bright tawny ochraceous; a dark dorsal area considerably darker than sides usually well marked; dusky orbital ring and spot at base of whiskers sharply defined; feet white, thinly haired, broadly brownish on tarsal joints; underparts yellowish white, usually without fulvous pectoral area; tail blackish all around, scaly part sometimes with indistinct zones of dull yellowish brown at irregular intervals in its length.

Skull.—Similar to that of *megalops*, but slightly smaller and more stoutly built; rostrum thicker; teeth and audital bullæ smaller; interparietal large and quite produced posteriorly; frontals wide and distinctly beaded; anterior part of zygomata scarcely or not at all notched by infraorbital foramen. Somewhat similar to that of *mexicanus* but larger; frontals wider and more distinctly and extensively beaded; teeth larger; audital bullæ about same size.

Measurements.—Average of 10 adult topotypes: Total length, 259 (238–278); tail vertebræ, 135 (127–145); hind foot, 27.3 (26–28.5); ear from notch (dry), 17 (15.8–17.8).

Remarks.—This form shows quite a marked departure from *megalops* in size and external appearance, but since it agrees with it closely in cranial characters it seems best to treat it as a subspecies. It inhabits lower and doubtless warmer localities than *megalops*, in this respect, as well as others, standing between the *megalops* series and the *mexicanus* series. Its uniformly dark tail is almost diagnostic but not quite so, as rare variants in the *mexicanus* series approach it. It is not so heavily haired as in *melanocarpus*.

Specimens examined.—Total number 18, all from the type locality.

PEROMYSCUS MELANOCARPUS Osgood.

Peromyscus melanocarpus Osgood, Proc. Biol. Soc. Wash., XVII, pp. 73-74, Mar. 21, 1904.

Type locality.—Mount Zempoaltepec, Oaxaca, Mexico.

Geographic distribution.—Known only from the upper slopes of Mount Zempoaltepec.

Characters.—Similar to *P. megalops*, but smaller and darker; hind feet slightly darker; fore feet decidedly more so, the blackish extending to base of digits; tail usually dusky all around and with only traces of paleness beneath; pelage long and soft.

Color.—No. 68627, adult ♂, July 17: General effect of upperparts dark blackish mummy brown, slightly darker along middle of back; actual color of subterminal zone of hairs cinnamon rufous, which is almost lost in the general effect by the many black-tipped hairs and the dark plumbeous undercolor which shows through the thin subterminal zone; underparts deep blackish slate washed with creamy white, producing an effect which varies from olive gray to slate gray; pectoral region usually rich cinnamon rufous; an intense black line extending from nostrils through base of whiskers and eye: tail covered with short, bristly, blackish hairs scarcely paler below than above; scaly annulations of tail usually dusky all around, sometimes with slight irregular patches of paler; fore and hind feet dusky brownish to base of toes.

Skull.—Similar to that of *megalops*, but smaller; nasals slightly shorter and more compressed posteriorly. Superficially similar to that of *totontepecus*, but differing as follows: Nasals shorter and nearly always ending in advance of the orbits about on a plane with the infraorbital foramen; frontals wider and with decidedly greater development of supraorbital shelves; braincase wider; anterior palatine foramina much longer; molar teeth larger. Differs from that of *lepturus*, as follows: Braincase larger and broader; frontal wider and quite distinctly beaded; nasals longer.

Measurements.—Type (not quite adult): Total length, 241; tail vertebræ, 125; hind foot, 27; ear from notch (dry), 19.2. Adult ♂ from Totontepec, Oaxaca: 262; 132; 30.

Type specimen.—No. 68610 U. S. National Museum, Biological Survey Collection. ♀ adolescent. July 8, 1894. E. W. Nelson and E. A. Goldman. Specimen in good condition.

Remarks.—This mountain species is about the size of *P. m. totontepecus*, with which it ranges to some extent, but is much more closely related to *megalops* and *auritus*, as indicated by its cranial characters and its more bristly tail. Its most diagnostic character, however, is the extent of dusky brownish on the fore feet, which is almost unique. In some specimens the ends of the toes and the outer side of the metacarpus are the only parts not occupied by the dark color. The pelage is long and lax, like that of many other mountain forms. The type was taken at 8,000 feet altitude, and specimens from Totontepec on the north slope of the same mountain at 6,500 feet altitude show that it ranges to slightly lower levels. *P. lepturus*, which also occurs on Mount Zempoaltepec, is smaller than *melanocarpus* and differs in numerous cranial characters.

Specimens examined.—Total number 6, from localities as follows:

Oaxaca: Mount Zempoaltepec at 8,000 feet altitude, 1; Totontepec, 5.

PEROMYSCUS ZARHYNCHUS Merriam.

(Pl. VI, fig. 1.)

Peromyscus zarhynchus Merriam, Proc. Biol. Soc. Wash., XII, p. 117, Apr. 30, 1898.

Peromyscus zarhynchus cristobalensis Merriam, *supra cit.*, pp. 117–118.—San Cristobal, Chiapas.

Type locality.—Tumbala, Chiapas, Mexico. Altitude 5,500 feet.

Geographic distribution.—Highlands of Chiapas and Guatemala.

Characters.—Size very large, exceeded only in the subgenus *Megadontomys;* tail very long, always longer than head and body, rather finely scaly and scantily clothed with short hairs; soles of hind feet naked medially to calcaneum; color dark; skull with very elongate rostrum.

Color.—Unworn pelage? (No. 76120): Middle of back from shoulders to base of tail deep blackish brown very lightly sprinkled with russet, producing a general effect of mummy brown; sides, shoulders, and most of head cinnamon rufous mixed with dusky, producing a general effect varying from russet to Mars brown; lateral line rather broad, clear cinnamon rufous; orbital and antorbital regions dark blackish brown not very sharply contrasted; underparts yellowish white, with or without pectoral spot, sometimes entirely suffused with cinnamon; feet soiled whitish, tarsal joint broadly brownish and proximal part of foot slightly brownish; scaly part of tail evenly bicolor, dusky above and whitish below or dusky above and irregularly blotched below. Worn pelage: Slightly paler, more grayish, than in unworn pelage and with dark dorsal area less contrasted.

Skull.—Size very large, equaling that of *P. thomasi* in length but general form lighter; nasals, rostrum, palatine slits, etc., very long; shelf of bony palate rather short; interpterygoid fossa and audital bullæ about as in *guatemalensis* and *thomasi;* frontals quite constricted; supraorbital border sharp-angled but rarely showing any definite bead; zygomata slightly compressed anteriorly and but slightly notched; lower side of infraorbital plate somewhat produced forward; teeth larger than in *guatemalensis* but smaller than in *thomasi*.

Measurements.—Average of 10 adult topotypes: Total length 316 (305–327); tail vertebræ 170.7 (162–178); hind foot 35.7 (33.5–38); ear from notch (dry) 22.2 (21.2–24). Average of 10 adults from San Cristobal, Chiapas: Total length 312 (303–323); tail vertebræ 166 (157–174); hind foot 33.8 (33–36).

Type specimen.—No. 76119 U. S. National Museum, Biological Survey Collection. ♀ adult. October 20, 1895. E. W. Nelson and E. A. Goldman. Specimen in good condition.

Remarks.—This is the largest species of *Peromyscus* except those of the subgenus *Megadontomys.* Its size, therefore, is sufficient to distinguish it. The skull is characterized by a very long rostrum, longer even than in *Megadontomys.* The supraorbital border is not beaded, being about as in *guatemalensis.* The teeth are not peculiar, but a few specimens show a faint suggestion of the inner enamel island of the anterior triangle of the first upper molar, which is well developed in *Megadontomys.* This species is represented by two fairly good series, one from Tumbala and one from San Cristobal. There is considerable variation in each series, both in color and in cranial characters. No constant, nor even average, difference in cranial characters appears, and in color the very slight average difference is scarcely more than is found between any two series of one species. The environmental conditions of Tumbala and San Cristobal are nearly alike, and the distance between the two places is not great.

Specimens examined.—Total number 36, from localities as follows:

Chiapas: San Cristobal, 22; Tumbala, 14.

Subgenus MEGADONTOMYS Merriam.

Megadontomys Merriam, Proc. Biol. Soc. Wash., XII, pp. 115–116, Apr. 30, 1898.

Type.—*Peromyscus thomasi* Merriam.

Subgeneric characters.—Size very large, slightly exceeding the largest species, and greatly exceeding the majority of the species of the other subgenera of *Peromyscus;* molar teeth largest and heaviest of the genus; tubercles of molars low and usually worn flat at an early stage; supplementary tubercles (in primary angles of both upper and lower molars) more highly developed than in the subgenus *Peromyscus;* first upper molar, when slightly worn, presenting five salient and four reëntrant outer angles; anterior loop of first upper molar, when somewhat more worn, containing a subcircular enamel island, which is the persistent part of the first outer reëntrant angle; first and second lower molars with a prominent and well-developed supplementary enamel loop in the outer primary reëntrant angles; third lower molar presenting three salient and three reëntrant angles on each side during a much longer period of wear than in the subgenus *Peromyscus*. Plantar tubercles of hind foot 6, as in *Peromyscus*. Mammæ 6, pectoral $\frac{1}{1}$, inguinal $\frac{2}{2}$.

Species.—*P. thomasi*, *P. nelsoni*, and *P. flavidus*.

Remarks.—Nearly all the characters of this subgenus are relative rather than absolute. The development of the supplementary cusps, particularly those of the lower molars, gives the enamel pattern of the worn tooth quite a different appearance from that in the subgenus *Peromyscus*. These supplementary cusps, however, are quite well developed in the upper molars of true *Peromyscus*, and are present also, but little developed, in the lower molars. As seen in the profiles of unworn teeth, these cusps are merely larger and higher in *Megadontomys* than in *Peromyscus*. Therefore the slightly worn surface of the molars of *Megadontomys* presents a pattern different from that *of Peromyscus* at the same stage of wear, but when the molars of *Peromyscus* are worn to a greater degree the cross section shown by the upper surfaces is essentially the same as that of *Megadontomys*. In *Haplomylomys*, the 'supplementary cusps' are entirely absent, in *Peromyscus* they are variously developed, and in *Megadontomys* they find their greatest development. Some authors have hastened to give *Megadontomys* full generic rank, but in view of the relative nature of its characters this seems ill advised.

Key to species of subgenus Megadontomys.

Anterior tubercle of first upper molar distinctly divided longitudinally	*P. flavidus*
Anterior tubercle of first upper molar scarcely or not at all divided.	
Supraorbital border somewhat beaded	*P. thomasi*
Supraorbital border not beaded	*P. nelsoni*

PEROMYSCUS THOMASI MERRIAM.

(Pl. V, fig. 13; pl. VI, figs. 3–3a; pl. VII, fig. 5; pl. VIII, figs. 1, 1a, 1b, 1c.)

Peromyscus (*Megadontomys*) *thomasi* Merriam, Proc. Biol. Soc. Wash., XII, pp. 116, 120, fig. 20, Apr. 30, 1898.

Megadontomys thomasi Bangs, Bull. Mus. Comp. Zool., XXXIX, p. 27, 1902.

Type locality.—Mountains near Chilpancingo, Guerrero, Mexico. Altitude, 9,500 feet.

Geographic distribution.—High altitudes in mountains of central Guerrero, Mexico.

Characters.—Size very large, equaling and often slightly exceeding *P. zarhynchus;* tail decidedly longer than head and body, nearly unicolor and closely covered with short bristly hairs, which do not quite conceal the annulations; ears large and minutely hairy, appearing almost naked; soles of hind feet naked to calcaneum; pelage long and rather coarse; color similar in general to that of *P. megalops;* skull with supraorbital beads.

Color.—Unworn pelage: General color much as in *P. megalops*, but averaging slightly darker. Upperparts rich tawny mixed with black, the tawny everywhere predominating; back only very slightly darker than sides; sides with relatively little black admixture, leaving the general effect from the cheeks to the thighs nearly pure tawny; nose and region about base of whiskers black; orbital ring black; underparts creamy white, usually somewhat modified by slaty under color, and occasionally with a slight suffusion of tawny in the pectoral region; fore feet white; forearm dusky brownish three-fourths of the way around; hind feet white, tarsal joint and distal part of hind leg dusky brownish all around; hairs of tail dusky all around; scaly part of tail chiefly dusky above and below, but occasionally light yellowish on proximal half of under side. Worn pelage: Similar to unworn pelage, but general appearance rougher; under color more or less exposed and an extensively dusky dorsal area well differentiated.

Skull.—Size very large, equaling that of *zarhynchus* in length and exceeding it in massiveness; supraorbital border distinctly beaded; nasals long, slightly shorter and wider than in *zarhynchus;* zygomata decidedly convergent anteriorly and scarcely notched by infraorbital foramen; interparietal very large, often produced to a sharp angle posteriorly; palatine slits very large; interpterygoid fossa wide; audital bullæ moderate, about as in *zarhynchus;* molar teeth large and heavy, larger than in any species of the subgenus *Peromyscus;* molar enamel pattern peculiar in most stages of wear (see subgeneric diagnosis).

Measurements.—Average of 7 adult topotypes: Total length, 330 (310–350); tail vertebræ, 175 (162–188); hind foot, 32.8 (32–34); ear from notch (dry), 23 (21.4–24.8).

Type specimen.—No. 70142 U. S. National Museum, Biological Survey Collection. ♂ adult. Dec. 24, 1894. E. W. Nelson and E. A. Goldman. Specimen in good condition.

Remarks.—Although equaled, or nearly equaled, in size by *P. zarhynchus*, this species is so well characterized by cranial and dental characters as not to require close comparison. Its only close relationship, of course, is with the other member of the subgenus *Megadontomys* (*nelsoni*), from which is is distinguished by its lighter, more extensively tawny color and by its distinctly beaded skull. Externally it very closely resembles *P. megalops*, merely being somewhat larger and showing the same character of pelage and the same extensively tawny color in unworn pelage.

Specimens examined.—Total number 14, from localities as follows:

Guerrero: Mountains near Chilpancingo, 7; Omilteme, 7.

PEROMYSCUS NELSONI MERRIAM.

Peromyscus (*Megadontomys*) *nelsoni* Merriam, Proc. Biol. Soc. Wash., XII, pp. 116–117, Apr. 30, 1898.
Megadontomys nelsoni Bangs, Bull. Mus. Comp. Zool., XXXIX, p. 27, 1902.

Type locality.—Jico, Veracruz, Mexico. Altitude 6,000 feet.

Geographic distribution.—Known only from the type locality.

Characters.—Similar to *P. thomasi* but color less extensively tawny and skull without distinct supraorbital beads.

Color.—Slightly worn pelage: Upperparts mixed tawny and dusky; general effect of sides cinnamon to russet and tawny olive; middle of back with dusky largely predominating, general effect raw umber to bister; dusky markings about eyes and base of whiskers rather heavy; fore feet white; forearm dusky to wrist; hind feet grayish dusky; toes white, tarsal joint broadly brownish; tail unicolor, dusky all around.

Skull.—Similar to that of *thomasi*, but frontals slightly more constricted and supraorbital beads comparatively undeveloped.

Measurements.—Type and one topotype, respectively: Total length, 302, 318; tail vertebræ, 172, 170; hind foot, 35, 32; ear from notch (dry), 20.

Type specimen.—No. 55024 U. S. National Museum, Biological Survey Collection. ♀ adult. July 10, 1893. E. W. Nelson and E. A. Goldman. Specimen in good condition; last left upper molar absent.

Remarks.—Probably the real color difference between *nelsoni* and *thomasi* is rather slight or practically nothing. The only known specimens of *nelsoni* are in slightly worn pelage and, although different from the majority of specimens of *thomasi*, are scarcely distinguishable from equally worn specimens. The absence of supraorbital beads, however, appears to be distinctive.

Specimens examined.—Total number 2, both from the type locality.

PEROMYSCUS FLAVIDUS (BANGS).

(Pl. VI, figs. 2–2a; pl. VII, fig. 8.)

Megadontomys flavidus Bangs, Bull. Mus. Comp. Zool., Cambridge, Mass., XXXIX, pp. 27–29, figs. 5–7, Apr., 1902.

Type locality.—Boquete, south slope Volcan de Chiriqui, Panama.

Geographic distribution.—Known only from the type locality.

Characters.—Similar to *P. thomasi* but decidedly larger; ears relatively smaller; color slightly paler with less dusky about head; skull with heavy rostrum characterized by long nasals and laterally swollen premaxillæ; anterior lamina of first upper molar longitudinally divided.

Color.—Similar to that of *thomasi*, but averaging slightly paler; blackish markings about head less extensive, chiefly confined to base of whiskers; underparts more yellowish; entire upperparts, head, back, sides, etc., rich ochraceous rather coarsely lined with dusky; lower cheeks and lateral line ochraceous scarcely or not at all mixed with dusky; nose and forehead a slightly paler shade of ochraceous than body; a narrow dusky orbital ring and a well-defined brownish dusky spot at base of whiskers; underparts yellowish white, without pectoral spot; forearm dusky to wrist; fore feet white; hind feet whitish, more or less mixed with dusky brownish to base of toes; toes white; tail thinly clothed with very short hairs, usually indistinctly bicolor. Worn pelage: Upperparts a richer shade of ochraceous (more nearly tawny), with dusky mixture slightly modified and blended.

Skull.—Decidedly different from that of *P. thomasi;* larger, higher, and relatively narrower; rostrum much heavier, with nasals more extended backward and premaxillæ much more swollen laterally; anterior palatine foramina shorter and wider; teeth and audital bullæ actually and relatively smaller; supraorbital beads strongly developed; nasals ending far back, at least on plane of lacrymals; interparietal scarcely produced posteriorly; coronoid process of mandible broad, strong, and elevated; teeth relatively short and broad; $\underline{\text{m1}}$ with anterior lamina distinctly divided, making 6 cusps instead of 5; lower molars with supplementary loops slightly developed, much less than in *Megadontomys*, about as in *Peromyscus*.

Measurements.—Average of 10 adult topotypes: Total length, 341.6 (320–375); tail vertebræ, 181.2 (155–205); hind foot, 31.8 (31–33); ears, 22.5 (20–24).

Type specimen.—No. 10331 Museum Comparative Zoology. Cambridge, Mass., formerly same number, collection of E. A. and O. Bangs. ♂ adult. April 12, 1901. W. W. Brown, jr.

Remarks.—The inclusion of this species within the genus *Peromyscus* is provisional. In dentition it decidedly approaches several neotropical genera. The first upper molar in fact is almost completely six-cusped, whereas in typical *Peromyscus* this tooth is five-cusped. However, an approach to the six-cusped condition is shown in *P. thomasi*, in which the anterior lamina of the tooth is incompletely divided. Moreover, *P. thomasi* is closely similar to *P. flavidus* in external characters. Since the generic relationships of various neotropical murines are imperfectly understood, it seems best for the present to retain *P. flavidus* in the subgenus *Megadontomys*.

Specimens examined.—Total number 27, all from the type locality.

Subgenus OCHROTOMYS nobis.

Type—Arvicola nuttalli Harlan (=*Peromyscus nuttalli*).

Subgeneric characters.—Color of young in first pelage essentially same as that of adult; hairs clothing ears of same color as those of upperparts; abdomen suffused with color of upperparts. Plantar tubercles 6, with a rudimentary seventh, adjacent to the large tubercle at the base of the fifth digit. Mammæ 6; inguinal $\frac{2}{2}$, pectoral $\frac{1}{1}$. Posterior palatine foramina situated farther back than in *Peromyscus*, being decidedly nearer to the interpterygoid fossa than to the posterior endings of the anterior palatine slits. Molariform teeth relatively wide, and with enamel folds much compressed; tubercles relatively low; a tendency to development of a raised cingulum marked by subsidiary tubercles in the inner salient angles of $\underline{m1}$ and $\underline{m2}$; enamel relatively thicker than in subgenus *Peromyscus*, the pattern as seen in partly worn teeth being much compressed both laterally and longitudinally, so that the folds of the two sides touch in almost all stages of wear, leaving five subtriangular islands of dentine in $\underline{m1}$ and four in $\underline{m2}$; lower molars similarly peculiar.

Species.—One, the type only.

Remarks.—It is rather surprising that the numerous characters of *P. nuttalli* have not been accorded more than specific rank. It differs widely from all other species of the genus in external, cranial, and dental characters. Its general appearance is striking, not only on account of the bright uniform color, the ochraceous ears and belly, but also for the peculiar pelage, which is extremely dense and soft, suggesting that of the tropical murine opossums.

Although the tubercles of its teeth number the same as in the subgenus *Peromyscus*, and, as seen in cross section, show the same number of enamel folds, the relation of these folds to each other and to the dentine is different. In general, the enamel is thicker and occupies a relatively greater part of the upper surface of the worn tooth. Except in extremely old individuals, the dentine areas are not confluent, whereas in *Peromyscus*, even in teeth but slightly worn, these areas are all, or nearly all, confluent through narrow constrictions. This gives the worn surface of the tooth a characteristic aspect which, upon hasty examination, might lead to the conclusion that the enamel pattern is much more complicated than in true *Peromyscus*. The tendency to greater development of a raised cingulum is difficult to appreciate without examination of many teeth of different ages. When the teeth are worn to the level of this raised part of the cingulum (and this occurs before the obliteration of any important angles), the lateral angles are bridged, as it were, and the outer boundaries of the teeth are entire; that is, all the angles are inclosed.

Key to subspecies of Peromyscus nuttalli.

Size larger; maxillary toothrow about 4 ---------------------------------- *P nuttalli*
Size smaller; maxillary toothrow, usually less than 4 -------------------- *P. n. aureolus*

PEROMYSCUS NUTTALLI (HARLAN). NORTHERN GOLDEN MOUSE.

(Pl. V, fig. 11; pl. VI, figs. 7–7a; pl. VII, fig. 2; pl. VIII, figs. 5–5a.)

Arvicola nuttalli Harlan, Monthly Am. Jour. of Geol. and Nat. Sci., Phila., I, pp. 446–447, Apr., 1832; Med. and Phys. Researches or Orig. Memoirs, Phila., pp. 55–56, col. pl., 1835.

Hesperomys nuttalli Baird, Mamm. N. Am., Pac. R. R. Repts., VIII, pp. 467–468, 1857.

Peromyscus nuttalli Bangs, Proc. Bost. Soc. Nat. Hist., XXVIII, p. 197, Mar., 1898.

Type locality.—Norfolk, Va.

Geographic distribution.—Southeastern Virginia and northern North Carolina; west to central Kentucky.

Characters.—In general those of the subgenus *Ochrotomys*, of which it is the only species. Pelage very soft and thick; color chiefly rich tawny ochraceous; ears same color as body; abdomen suffused with ochraceous; proximal half of hind foot hairy; skull and teeth somewhat peculiar.

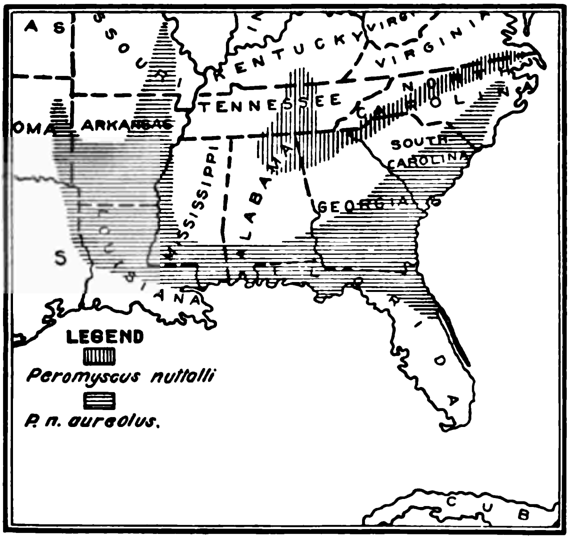

FIG. 9.—Distribution of *Peromyscus nuttalli* and *P. n. aureolus*.

Color. — Upperparts in all pelages rich tawny ochraceous, nearly clear on sides, lightly mixed with dusky on back in fresh pelage; face and head exactly like sides; underparts creamy white suffused with ochraceous on abdomen, this often extending to entire underparts except chin and throat; hairs with slate-colored bases throughout, except on chin and throat and a small inguinal area where they are creamy white to the roots; ears tawny ochraceous like sides; whiskers mixed brownish and whitish, no dusky spot at base and no orbital ring; forearm extensively ochraceous; feet creamy white; tail pale brownish (near broccoli brown) above, creamy white below. Young: Similar to adults but slightly paler; ears thickly haired and conspicuously bright ochraceous.

Skull.—Somewhat similar in general form to that of *leucopus* but relatively broader; braincase rather full, somewhat elevated; nasals rather short, usually somewhat compressed posteriorly; rostrum rather broad, particularly across lacrymals; interpterygoid fossa broad and nearly square-angled anteriorly; posterior palatine foramina about opposite middle of $\underline{m2}$, decidedly nearer to interpterygoid fossa than to plane of front of $\underline{m1}$; molar teeth peculiar (see subgeneric diagnosis).

Measurements.—Average of 10 adults from the Dismal Swamp, Virginia: Total length, 181 (170–190); tail vertebræ, 85 (80–93); hind foot, 19.7 (19–20); ear from notch (dry), 15.5 (14.4–16.4).

Type specimen.—Not known to be in existence.

Remarks.—The many characters of this species make it unmistakable. To those unfamiliar with it the color of the ears alone will serve as a means of certain identification, for it is the only species in the genus having ochraceous ears, the same color as the body. It is perhaps best known under the name *aureolus*, which has long been in use. The name *nuttalli*, employed by Baird in 1857 and then discarded by later authors, was revived by Bangs in 1898. The original description by Harlan does not mention any characters that are diagnostic; indeed it states that the animal was "fawn-coloured above, whitish beneath," which really applies better to *leucopus* than to this species. However, a colored figure published two years later by the same author more nearly represents this species than *leucopus* or *gossypinus*, the only others which might have been found at Norfolk, the type locality. It represents a mouse with ears colored like the body and with the underparts washed with buffy. It shows also the body color extending entirely over the feet, a peculiarity not found in any of the species and which might be taken to discredit the figure altogether. Since, however, nothing definite can be proved it seems best to follow current usage and allow the name *nuttalli* to stand for the species under consideration. Specimens from the Dismal Swamp, Virginia, only a few miles from Norfolk, are larger and have larger molar teeth than specimens from more southern localities and seem subspecifically separable. The name *nuttalli* therefore will stand for this northern form, and for the southern and more widely ranging form the well-known name *aureolus* is available.

Specimens examined.—Total number 90, from localities as follows:

Kentucky: Eubanks, 7.
North Carolina: Asheville, 1; Buncombe, 3; Highlands, 1; Magnetic City, foot of Roan Mountain, 7; Weaverville, 29.
Tennessee: High Cliff, 1; Knoxville, 1.
Virginia: Dismal Swamp, 40.

PEROMYSCUS NUTTALLI AUREOLUS (AUD. AND BACH.). SOUTHERN GOLDEN MOUSE.

Mus* (*Calomys*) *aureolus Audubon and Bachman, Proc. Acad. Nat. Sci., I, pp. 98–99, 1841.
Peromyscus aureolus Trouessart, Catal. Mamm., p. 517, 1897.

Type locality.—" In the oak forests of South Carolina."

Geographic distribution.—Southeastern United States from North Carolina to northern Florida; west to eastern Texas and Oklahoma. Lower Austral zone.

Characters.—Similar to *nuttalli*, but averaging smaller; skull and molar teeth smaller.

Color.—As in *nuttalli;* at the extreme of its range possibly averaging very slightly paler.

Skull.—Similar to that of *nuttalli*, but smaller and narrower actually and relatively; molar teeth quite decidedly smaller.

Measurements.—Average of 7 adults from Milton, Fla.: Total length, 172.5 (164–184); tail vertebræ, 83 (80–88); hind foot, 18.8 (17–20); ear from notch (dry), 14.1 (13.4–14.6). Of a large male from Augusta, Ga.: Total length 175; tail vertebræ 90; hind foot 19; ear from crown 11.5; ear from notch 17.

Type specimen.—Not known to be extant.

Remarks.—The amount of difference between this form and typical *nuttalli* is not great, but is reasonably constant in the material thus far examined. Two small series from Eubanks, Ky., and Magnetic City, N. C., respectively, have been referred to *nuttalli* on account of their rather large teeth. Their skulls, however, are not very large, and it is not improbable that larger series from these localities would prove to be more or less intermediate. A large series from Raleigh, N. C., seems referable to *aureolus*, though somewhat intermediate.

Specimens examined.—Total number 160, from localities as follows:

Alabama: Brewton, 1; Huntsville, 1; Mobile Bay, 1.
Arkansas: Beebe, 1.
Florida: Enterprise, 2; Gainesville, 2; Jacksonville, 1; Milton, 8; New Berlin, 1; San Mateo (16 m. southeast), 1; Tallahassee, 3; Whitfield, 6.[a]
Georgia: Augusta, 8; Hoschton, 1; Pinetucky, 6; Riceboro? ("Southern States," Leconte), 1.
Louisiana: Mansfield, 1.
Missouri: St. Louis, 1.
North Carolina: Apex, 2; Bertie County, 2; Chapanoke, 4; Raleigh, 92; Roanoke Rapids, 1.
Oklahoma: Redland, 2.
South Carolina: Calhoun Falls, 8; Charleston, 1; Columbia, 1.
Texas: Joaquin, 1.

Subgenus PODOMYS nobis.

Type.—*Hesperomys floridanus* Chapman (=*Peromyscus floridanus*).

Subgeneric characters.—Plantar tubercles of hind foot 5 instead of 6, as in the other subgenera of *Peromyscus;* digital tubercles 3, phalangeal 2, the latter much reduced in size and subcircular in shape.

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[a] Carnegie Museum.

Molar teeth slightly more hypsodont than in *Peromyscus*, less so than in *Onychomys;* accessory tubercles in salient interangles of molars very small, as seen in transverse section, never forming a loop which extends to the outer edge of the tooth, as in *Peromyscus.* Mammæ: 6 (i., $\frac{2}{2}$, a., $\frac{0}{0}$, p., $\frac{1}{1}$).

Species.—One, the type only.

Remarks.—The constancy of the number and relative size of the plantar tubercles throughout the genus *Peromyscus* is so great that the decided departure shown by *P. floridanus* must be considered of more than specific importance. In other respects the species does not differ so greatly from *Peromyscus*, although its skull is well characterized specifically, and its teeth are somewhat peculiar. The reduction in the number of plantar tubercles and the large, slightly more hypsodont teeth suggest the possibility that this form may be intermediate between *Peromyscus* and *Onychomys.*

Fresh or alcoholic specimens are necessary for an appreciation of the character of the plantar tubercles, as in dry specimens the tubercles are so much distorted that their character, or even their number, may be mistaken.

PEROMYSCUS FLORIDANUS (CHAPMAN).

(Pl. V, fig. 14; pl. VI, figs. 6–6a; pl. VII, fig. 1; pl. VIII, fig. 8.)

Hesperomys floridanus Chapman, Bull. Am. Mus. Nat. Hist., N. Y., II, p. 117, June, 1889.

Hesperomys macropus Merriam, N. Am. Fauna No. 4, pp. 53–54, Oct. 8, 1890. Lake Worth, Florida.

Peromyscus floridanus Bangs, Proc. Biol. Soc. Wash., X, p. 122, 1896.

Type locality.—Gainesville, Fla.

Geographic distribution.—The central part of peninsular Florida from coast to coast.

Characters.—Size large (hind foot 25–27); tail shorter than head and body; ears large and thinly haired; proximal fifth of sole of hind foot hairy, remainder nearly naked; plantar tubercles 5 (see subgeneric diagnosis); color paler than in *leucopus* or *gossypinus.*

Color.—Unworn pelage: Top of head, neck, back, and upper sides pale ochraceous buff finely mixed with dusky, producing a pale grayish-cinnamon effect; lower sides from nose to base of tail rich ochraceous buff, very lightly or not at all mixed with dusky; subauricular tufts mixed pale ochraceous buff and dusky; thin hairiness of outside of ears dusky, of inside whitish; underparts creamy white, often with an ochraceous buff pectoral spot; feet and forelegs chiefly white, upper side of hind feet somewhat dusky at base; tail brownish dusky above, creamy white below. Worn pelage: Similar to unworn pelage, but sides more broadly ochraceous and back less dusky; tail often dingy and very indistinctly bicolor. Adolescent pelage:

Scarcely different from adult pelage, possibly a little more dusky with sides less broadly ochraceous. Young in first coat: General effect of upperparts varying from smoke gray to drab gray, shading into mouse gray on middle of back.

Skull.—Size large and depth relatively great; supraorbital border rather sharp and shelf like; posterior end of nasals slightly exceeding ascending branches of premaxillaries; palatine slits rather short and expanded; interpterygoid fossa rather wide and nearly right-angled anteriorly. Molars large and broad, the tubercles considerably elevated; accessory tubercles between outer salient angles small or scarcely evident.

Measurements.—Average of 10 adults from Fort Gardner, Fla.: Total length, 199.8 (190–221); tail vertebræ, 86.2 (80–95); hind foot, 26.6 (26–27.5); ear from notch, 22.5 (22–25).

Type specimen.—No. 1812 American Museum of Natural History, New York. Skin without skull. Immature. Sex (?). Oct., 1888. J. H. P. Bell. Skin in rather poor condition, both hind legs dangling, distal half of tail gone.

Remarks.—*P. floridanus* is the largest species of *Peromyscus* native in the eastern United States. This fact alone serves to distinguish it without reference to its subgeneric characters. The limited distribution of this very distinct form suggests that it may be one of the well-known stranded forms representing a group of former wide distribution. Of its habits in Florida, Bangs says:[a]

> It lives only in the higher sandy ridges, where there is plenty of black-jack oak and turkey oak, and where the bare white sand is in places covered by scattered patches of scrub palmetto. It is the characteristic small mammal of such places, commonly known as 'black-jack ridges,' and I have never found it elsewhere.

Specimens examined.—Total number 147, from localities as follows:

Florida: Anastasia Island, 8; Blitch Ferry, 1; Canaveral, 2; Citronelle, 4; Crystal River, 1; Eau Gallie, 5; Enterprise, 69; Fort Gardner, Kissimee River, 29; Gainesville, 2; Lake Worth, 8; Micco, 9; Miami, 3; Ocklawaha River, 2; Sebastian, 1; Tarpon Springs, 3.

Subgenus HAPLOMYLOMYS Osgood.

Haplomylomys Osgood, Proc. Biol. Soc. Wash., XVII, pp. 53–54, fig. 1, Mar. 21, 1904.

Type.—*Hesperomys eremicus* Baird (=*Peromyscus eremicus*).

Characters.—Tail rather long, always longer than head and body; plantar tubercles 6; mammæ 4 (i., $\frac{2}{2}$, a., $\frac{0}{0}$, p., $\frac{0}{0}$); skull with cranium rather large and rostral region relatively weak; first and second upper molars usually with three salient and two reëntrant outer angles at all stages of wear; accessory tubercles between outer primary tubercles very rudimentary or absent; lower molars correspondingly simple. (See Pl. VIII, figs. 3–4).

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[a] Proc. Bost. Soc. Nat. Hist., XXVIII, p. 194, Mar., 1898.

Species.—*P. eremicus*, *P. californicus*, *P. goldmani*, and *P. crinitus.*

Remarks.—The simple character of the molar teeth is usually diagnostic of this group. No accessory cusps are evident either in transverse or longitudinal views of the molars, except in *P. crinitus*, and in this species they are extremely reduced. The presence of these accessory cusps in the other subgenera is, however, not always obvious at all stages of wear. Therefore it often requires close examination to determine properly the position of individual specimens. The external appearance of the members of this subgenus is slightly peculiar but not readily described, although experienced workers find little difficulty in its recognition. *P. californicus* and *P. eremicus* are usually recognized by their naked or nearly naked soles, but this peculiarity does not extend to *P. crinitus* and *P. goldmani*. *P. crinitus* is the most aberrant member in this group on account of the approach to the subgenus *Peromyscus* indicated by its molar teeth, but since it has only two pairs of mammæ it seems best to include it here.

Key to species of the subgenus Haplomylomys.

ADULTS.

Size large; hind foot 25–29 .... *P. californicus*
Size smaller; hind foot 19–24.
  Hind foot 19–22.
    Zygomata compressed anteriorly; nasals attenuate, slightly or not at all exceeded by premaxillæ .... *P. crinitus*
    Zygomata less compressed anteriorly; nasals broader and flatter; decidedly exceeded by premaxillæ .... *P. eremicus*
  Hind foot 22–24; sides of head ochraceous .... *P. goldmani*

Key to subspecies of Peromyscus crinitus.

Size smaller; hind foot 19–20; greatest length of skull usually less than 24; color pale. Southern Nevada to northern Lower California .... *P. c. stephensi*
Size larger; hind foot 20–21; greatest length of skull usually more than 24; color not so pale. Great Basin region from Oregon and Idaho to Arizona and New Mexico.
    Color more buffy ochraceous with a minimum of dusky mixture .... *P. c. auripectus*
    Color more grayish with a larger mixture of dusky .... *P. crinitus*

PEROMYSCUS CRINITUS (MERRIAM). CANYON MOUSE.

(Pl. III, fig. 9.)

Hesperomys crinitus Merriam, N. Am. Fauna, No. 5, pp. 53–54, July 30, 1891.
Peromyscus truei crinitus Trouessart, Catal. Mamm. Viv. et Foss., p. 517, 1897.
Peromyscus crinitus scitulus Bangs, Proc. New Eng. Zool. Club, I, p. 67, July 31, 1899.—Gardnerville, Nev.
Peromyscus crinitus Bangs, *supra cit.*

Type locality.—Shoshone Falls, Snake River, Idaho.

Geographic distribution.—Rocky cliffs and canyons of southern Idaho, eastern Oregon, eastern California, northern Nevada, and northwestern Utah. Upper Sonoran zone.

Characters.—Size medium; tail longer than head and body, thickly covered with long, soft hairs, terminating in a distinct pencil; ears rather large; pelage usually long and lax; hind foot hairy on proximal fourth or naked in median part to calcaneum; skull with rather wide, shallow braincase, and long, slender nasals.

Color.—Adult in new fall pelage: Upperparts pale ochraceous buff uniformly mixed with dusky; forehead, nose, and upper face slightly grayish; underparts white, frequently with a faint pectoral spot of buff; tail bicolor, sooty blackish above, white below; hands and feet white. Immature: Less buffy than adult, general color more grayish.

Skull.—Braincase broad and somewhat flattened; zygomata compressed anteriorly; rostrum slightly depressed and more or less rounded dorsally; nasals long and somewhat compressed posteriorly; ascending branches of premaxillæ usually attenuate and rarely exceeding nasals; audital bullæ moderate; molar teeth with accessory tubercles between outer angles very small and inconspicuous, worn teeth often showing same simple enamel pattern as in *P. eremicus.*

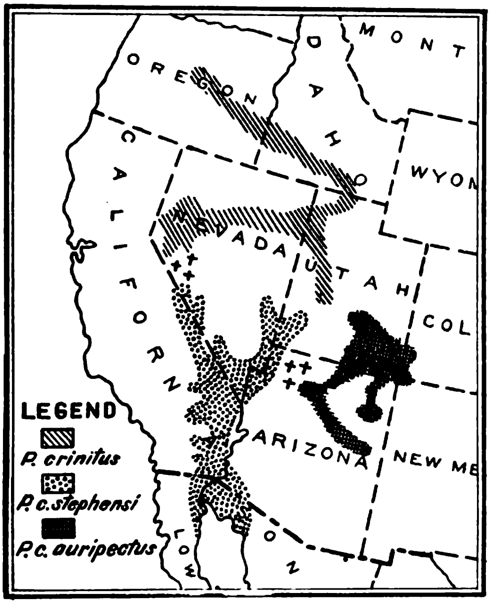

FIG. 10.—Distribution of *Peromyscus crinitus* and subspecies.

Measurements.—Average of 9 topotypes: Total length, 176 (172–184); tail vertebræ, 95 (92–97); hind foot, 21; ear from notch (dry), 16.3 (15.4–17.5).

Type specimen.—No. $\frac{24255}{31669}$ U. S. National Museum, Biological Survey Collection. ♂ adult. Oct. 10, 1890. C. Hart Merriam and Vernon Bailey. Specimen in good condition.

Remarks.—*P. crinitus* is a very distinct species confined chiefly to the Great Basin region. It is apparently rare, for it has been obtained at only a small number of localities and in limited numbers. Externally it is characterized by soft silky pelage, much as in *P. eremicus*, and by a hairy crested tail. It appears to be more closely related to *P. eremicus* than to any other species and apparently connects *Peromyscus* proper and *Haplomylomys.* It is referred to *Haplomylomys* because it has four mammæ, as in the other species of *Haplomylomys*, instead of six as in the subgenus *Peromyscus.* Many specimens show the simple enamel pattern as in *P. eremicus* and *P.*

californicus, but examination of large series of all ages proves the existence of the small tubercles as in typical *Peromyscus*, but so reduced in size as to be almost obsolete. *P. crinitus* may be distinguished from *eremicus*, regardless of other characters, by the rostral part of the skull. In *crinitus* the rostrum is more elongate, depressed, and rounded; the zygomata are much more compressed anteriorly; and the premaxillæ do not exceed the posterior ends of the nasals. The pelages of *crinitus* differ chiefly in the amount of dusky admixture present. The new fall pelage is strongly dusky and the general effect of the upperparts is decidedly grayish. In summer (June and July) specimens become worn, the dusky fades to brownish, and the buff or ochraceous buff ground color becomes dominant. Immature specimens are invariably grayish in general color.

P. crinitus scitulus seems to be the same as *crinitus*, having been based on August specimens in which the pelage appears more fulvous than in the Shoshone Falls specimens taken in October.

Specimens examined.—Total number 63, from localities as follows:

California: Amedee, 6; Coleville, 2; Susanville, 1.
Idaho: Shoshone Falls, 12; Silver Creek, 1.
Nevada: Anderson Ranch, Douglas County, 12; Elko, 1; Gardnerville, 9; Granite Creek, 3; Pyramid Lake, 4; Smoke Creek Desert, 1.
Oregon: Crooked River (20 m. southeast Prineville), 2; Harney, 4; Narrows, 1.
Utah: Beaver River, near Fort Cameron, 3; Parawan, 1 (not typical).

PEROMYSCUS CRINITUS AURIPECTUS ALLEN. BUFF-BREASTED CANYON MOUSE.

Sitomys auripectus Allen, Bull. Am. Mus. Nat. Hist., N. Y., V, pp. 75–76, Apr. 28, 1893.

Peromyscus auripectus Allen, Bull. Am. Mus. Nat. Hist., N. Y., VII, pp. 226–227, June 29, 1895.

Type locality.—Bluff City, San Juan River, Utah.

Geographic distribution.—Known from a limited number of localities in northeastern Arizona, southeastern Utah, and adjacent parts of Colorado and New Mexico.

Characters.—Similar in general to *P. crinitus*, but lighter colored and more buffy; tail heavily haired; skull as in *crinitus*.

Color.—Full winter pelage: Upperparts rich ochraceous buff, faintly lined with dusky on back, nearly clear on sides; head and face ochraceous buff; ears dusky brownish edged with buffy white; lanuginous ear tufts buffy sometimes mixed with white; underparts creamy white, frequently with a buffy ochraceous pectoral spot; entire underparts occasionally suffused with buffy; tail dusky brownish above, white below; hands and feet white.

Skull.—As in *P. crinitus;* possibly averaging slightly larger.

Measurements.—Average of 10 adult topotypes: Total length, 177.7 (174–182); tail vertebræ, 93 (89–98); hind foot, 20.8 (20–21); ear from notch (dry), 17.3 (16.6–18).

Type specimen.—No $\frac{5117}{3667}$ American Museum of Natural History, New York. ♀ adult. May 14, 1892. C. P. Rowley. Specimen in fair condition; skull with several slight imperfections.

Remarks.—In full winter pelage, this is a very attractive species. Its rich buff color is nearly unmixed with dusky and it is therefore quite conspicuous. It is really very closely related to *crinitus*, the chief difference being in color. Specimens from the Grand Canyon, Arizona, distinctly tend toward *P. c. stephensi.* The pectoral spot is variable and not always present. It is rather frequent among specimens from the type locality, but occurs in very few of a series from Holbrook, Arizona, and is then imperfectly developed. The Holbrook specimens, however, have a decided buffy suffusion throughout the underparts.

Specimens examined.—Total number 105, from localities as follows:

Arizona: Grand Canyon, near Mountain Spring, 9; Holbrook, 36; Keam Canyon, 9; Painted Desert, Little Colorado River, 4.

Colorado: Ashbaugh Ranch, 2; Coventry, 2; Grand Junction, 1;[a] Mesa Verde, 1; Plateau Creek, 1.

New Mexico: Chaco Canyon 4.

Utah: Bluff City, 26; Cainesville, 1; Henry Mountains (east base Mount Ellen), 1; Noland Ranch, 4; Uncompahgre Indian Reservation, 4.

PEROMYSCUS CRINITUS STEPHENSI MEARNS. STEPHENS CANYON MOUSE.

(Pl. III, fig. 10.)

Peromyscus stephensi Mearns, Proc. U. S. Nat. Mus., XIX, p. 721, July 30, 1899.

Peromyscus petraius Elliott, Field Col. Mus., Zool. Ser., III, p. 244, Jan., 1904.—Lone Pine, California.

Type locality.—"The lowest water, on the wagon road, in a canyon, at the eastern base of the Coast Range Mts., San Diego Co., California, near the Mexican Boundary Line."

Characters.—Similar to *P. auripectus*, but smaller and paler.

Geographic distribution.—Rocky situations in the Lower Sonoran zone from northeastern Lower California northward to the desert valleys and ranges of the Death Valley region and eastward across southern Nevada to southwestern Utah and northwestern Arizona.

Color.—General color much as in *P. eremicus;* ground color of upperparts pale ochraceous buff; facial region slightly grayish; a uniform mixture of dusky brownish covers upperparts except a narrow buff lateral line; underparts white or creamy white, occasionally with a buff pectoral spot. In worn pelages the amount and intensity of the dusky admixture varies greatly; in moderate wear the dusky changes to cinnamon and in extreme wear it almost entirely disappears, leaving only clear pale buff; the eyelids and whiskers are dusky at all times.

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[a] Collection of E. R. Warren.

Skull.—Similar to that of *auripectus* but smaller; lighter and more frail throughout; zygomata much compressed anteriorly; rostrum attenuate; molar teeth small.

Measurements.—Type: Total length, 193; tail vertebræ, 108; hind foot, 19. Average of 10 adults from Funeral Mountains, California: Total length, 170 (161–176); tail vertebræ, 94 (88–101); hind foot, 20; ear from notch (dry), 16 15.3–16.5).

Type specimen.—No. 61026 U. S. National Museum. ♀ adult. May 9, 1894. Collected by Dr. E. A. Mearns. The specimen is in very worn pelage and therefore very pale; moreover, it is slightly overstuffed, which also increases paleness. The specimen is perfect except for two slight breaks in the skull, one in the right zygoma and the other in the left side of the basioccipital.

Remarks.—This species is not definitely distinguishable from *P. eremicus* by color alone, although one who has handled large numbers of each may become sufficiently expert to discriminate them accurately in the majority of cases. The hairiness of the tail is usually sufficient to distinguish *stephensi* from *eremicus*, and a comparison of skulls usually removes all doubt. The long attenuate rounded rostrum of *stephensi* is always easily recognized in contrast to the high, flat rostrum with truncate nasals and long premaxillæ of *eremicus*. The species is not numerously represented from the region of the type locality, but was taken in very large numbers in the desert ranges of eastern California by the Death Valley Expedition. These northern specimens, when in the same pelage, do not differ from the type in color. The type has a somewhat longer tail and shorter hind foot than the average of the northern specimens, but may be exactly matched among them, so there seems no reason for recognizing *P. petraius*, the type of which has been examined. *P. stephensi* intergrades with *P. crinitus* as well as with *P. auripectus*. In the immense series of this form examined great variation in shade of color occurs, due to the various stages of wear in the pelage. The extent to which dusky becomes cinnamon or brown or other shades results in endless slight variations in general effect. Some series are entirely bright cinnamon; others are pale buffy gray mixed with dusky, etc.

Specimens examined.—Total number 449, from localities as follows:

Arizona: Dolan Spring, 2; Tinajas Altas, 1.

California: Amargosa River, 2; Argus Mountains, 13; Barstow, 6; Benton, 1; Burns Canyon, San Bernardino Mountains, 1; Cave Camp, Pahrump Valley, 6; Copper City, 5; Coso, 2; Coso Mountains, 2; Daggett, 1; Death Valley, 3; East base Coast Range, Mexican boundary, 1; Emigrant Spring, 13; Funeral Mountains, 17; Granite Springs, 5; Grapevine Spring, 2; Independence Creek, 2; Inyo Mountains, 7; Kern River, 15 m. northeast of Bakersfield, 1; Little Owens Lake, 7; Lone Pine, 33; Lone Willow Spring, 21; Long Valley, 1; Ludlow, 4; Morans, 1; Morongo Pass, 2; Maturango Spring, 14; New York Mountain, 4; Oro Grande, 14; Owens Lake, 4; Palm Springs, 8; Panamint Mountains, 113; Pilot Knob, near Yuma, 1; Providence Mountains, 2; Resting Springs, 10; San Felipe Valley, 2; Saratoga Springs, 17; Shepherd Canyon, 8; Twelve Mile Spring, 4; Victor, 5; 35 miles south of Victor, 2; Warrens Well, 1; White Mountains, 1; Wild Rose Spring, 6.

Lower California: Canyon Esperanza, 2; Cocopah Mountains, 2; Signal Mountain, 1.[a]

Nevada: Ash Meadows, 3; Charleston Mountains, 16; Gold Mountain, 2; Grapevine Mountains, 13; Pahroc Spring, 2; Pahrump Valley, 9; Thorp Mill, 8.

Utah: St. George, 11; Santa Clara, 2.

Key to subspecies of Peromyscus californicus.

Size larger; molars heavier. Central California........................*P. californicus*
Size smaller; molars weaker. Southern and Lower California..............*P. c. insignis*

PEROMYSCUS CALIFORNICUS GAMBEL. PARASITIC MOUSE.

(Pl. VI, fig. 5; pl. VIII, fig. 4.)

Mus californicus Gambel, Proc. Acad. Nat. Sci. Phila., IV, p. 78, August, 1848.

[*Hesperomys*] *parasiticus* (Cooper), Baird, Mamm. N. Am., U. S. Pac. R. R. Reports, VIII, p. 479, 1857.—*Nomen nudum.*

P[*eromyscus*] *californicus* Thomas, Ann. & Mag. Nat. Hist, ser. 6, XIV, p. 364, Nov., 1894.

Type locality.—Monterey, California.

Geographic distribution.—Upper Sonoran and Transition zones of the coast region of California from San Francisco Bay south to the vicinity of Santa Barbara, where intergradation with subspecies *insignis* occurs.

General characters.—Size very large, exceeding all other species in the United States; color dark, buffy pectoral spot frequently present; pelage long and lax; sole of pes naked to end of calcaneum (occasionally very narrowly naked or covered medially by ends of lateral-rooted hairs on tarsus between end of metatarsals and end of calcaneum); tail longer than head and body, well haired, but annulations not thoroughly concealed; ears very large and leafy, very thinly haired within and without; skull of moderate size and regular proportions; first and second upper molars without cusplets between outer angles between tubercles.

Color.—Topotype No. 31978 (Fresh winter pelage; date Oct. 1; second molt nearly complete): Ground color of upperparts russet (more grayish on back and more ruddy on sides) blending with broccoli brown on head, except cheeks, which are bordered below by a light line of russet; orbital ring dusky; upperparts everywhere much mixed with black, which is somewhat concentrated in middle of back; sides much paler in general effect than back; underparts creamy white, except base of tail, which is russet; forelegs pale russet, becoming dusky near end of carpus; manus white; pes white with a short dusky stripe extending down from hind leg; tail bicolor, black and white not sharply contrasted. Worn summer pelage (represented by No. 35405, Mountain View, Calif., Aug. 3): Upperparts cinnamon heavily mixed with Mars brown, back only slightly darker than sides; underparts 'bluish' white.

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[a] Collection of F. Stephens.

Skull.—Size large; proportions regular; nasals moderate, relatively shorter than in *P. sitkensis;* braincase rather full; audital bullæ large; molar teeth heavy; enamel pattern as shown in partly worn teeth with two simple involutions on outer sides of first and second molars.

Measurements.—Average of 10 adult topotypes: Total length, 243 (238–260); tail vertebræ, 133 (127–146); hind foot, 27 (26–29); ear from notch (dry), 22.3 (21.3–23.5).

Type specimen.—The specimen upon which the original description of *Mus californicus* was based was lost before it reached any museum. In his description, Gambel says of it:

> I captured but a single specimen of this species in a field near Monterey, upper California, which, with those of the former [*Dipodomys agilis*], I had the misfortune to lose.

Remarks.—This mouse easily ranks as the largest species of the genus in the United States. The only other California species with which it might be confused is *P. truei*, as a very large example of *truei* is sometimes found which in size approximates many small examples of *californicus*. This is particularly true of the skulls, which are sometimes almost exactly alike in size and contour. They may always be distinguished, however, by the dentition, as the rudimentary cusps in the lateral angles of the molars are well developed in *truei* and entirely absent in *californicus*. Specimens from within the range above defined vary somewhat. Those from Monterey, the type locality, fortunately represent neither extreme as regards either size or intensity of color. The characters of *californicus* which distinguish it from *insignis* (large size and dark color) are accentuated in specimens from Boulder Creek and other localities in the Santa Cruz Mountains. On the other hand, specimens from several localities in Santa Barbara, Ventura, and Los Angeles counties are referred to *californicus*, though unquestionably all are intermediate, and possibly some specimens from this region will prove to be actually more like *insignis* than *californicus*. Two immature and otherwise unsatisfactory specimens from Three Rivers and Cain Flat are somewhat doubtfully referred to *californicus*. These are the only records of the species from any part of the Sierra Nevada.

As shown by Allen,[a] females of this species are slightly larger than males, as in most species of the genus. The presence of a fulvous pectoral spot is more usual in *californicus* than in *insignis*. In many individuals it is entirely absent, while others show all degrees of its development from a mere trace to entire occupation of the ventral surface. The tendency to a white tip at end of tail is also somewhat irregular. In a series of 18 adults from Monterey, 4, or about 20 per cent, have white-tipped tails, which is the same percentage (40 out of 207) noted by Allen (loc. cit.) in a very large series. As a rule the amount of white is small, but the tails of No. 35408 from Mountain View and No. 107821 from Pescadero Creek have fully an inch of terminal white. The pelage changes of this species are not peculiar, but on account of the size of the animal they may be followed more readily than in the smaller species. The juvenile pelage is slate gray (No. 5, Ridgway). The first evidence of the adolescent pelage is a faint fulvous wash on the sides; this increases in intensity until the sides are clothed in new glossy pelage, while the middle of the back still remains dull plumbeous. The growths on the two sides usually approach each other and finally unite in the middle of the back, the occiput, nape, and rump being the last parts to acquire the new coat. In many cases this method of change is followed exactly and the line of demarcation between the juvenile and first adult pelage is sharply distinct from beginning to end and the whole process is easily followed; in others the last stages of change are almost imperceptible. This first adult condition of pelage is closely similar to the later full pelage as described above under *Color*. It is paler and less rufescent than the full pelage; the light subterminal zone of color in the hairs which determines the general body color is narrower, thus allowing more of the plumbeous undercolor to show through. The black tends to be well distributed instead of being somewhat concentrated in the middle of the back as in the full pelage. Immature pelages are to be found in almost every series of specimens, as the animals seem to breed throughout the year. Specimens of equal-sized young in soft plumbeous pelage have been examined as follows: Jan. 2 (Santa Paula); Feb. 18 (Santa Monica); April 29 (Twin Oaks); May 11 (San Diego); June 25 (Bear Valley); Aug. 1 (Mountain View); Oct. 25 (Santa Cruz Mountains); Nov. 12 (Dulzura); Dec. 27 (Pacific Grove). This includes nearly every month in the year and both northern and southern localities.

The molt of the adult is somewhat irregular and does not seem to be entirely dependent upon season. The majority of specimens seem to indicate two molts, one in early summer and another in late fall. Both of these are very insidiously accomplished. The winter pelage is acquired late in October or November and persists until the following spring.

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[a] Bull. Am. Mus. Nat. Hist., N. Y., VIII, p. 267, 1896.

The name parasitic mouse, first given to this species by Doctor Cooper, refers to the habit of living in or about the large 'nests' or 'houses' of *Neotoma fuscipes.* Other mice also inhabit these places and *P. californicus* is found elsewhere; moreover, it is probable that only deserted nests are frequented, so that the species is not strictly speaking parasitic. As the habit is very characteristic of *P. californicus*, however, the name may well be retained.

Specimens examined.—Total number 698, from the following localities:

> **California:** Alum Rock Park, 172; Arroyo Seco River, near Paraiso Springs, 3; Bear Valley, San Benito County, 9; Bear Basin, Monterey County, 3; Berkeley, 14; Big Basin, Santa Cruz County, 1; Big Pine Mountain, 1;[a] Boulder Creek, 5; Cain Flat, Mineral King Road, 1; Calabasas, 1; Carmel River, 14; Carpenteria, 2; Cone Peak, Monterey County, 4; Fort Tejon, 2; Fremont Peak, Gabilan Range, 4; Gaviota Pass, 1; near Gilroy, 1; Hueneme (10 miles east), 3; Indian Canyon, 2;[a] Indian Valley, Monterey County, 4; King City, 1; La Honda, 31; Las Virgines Creek, 2; Little Pine Canyon, 2;[a] Mansfield, 1; Mayfield, 2; Menlo, 2; Mono Flats, 2;[a] Monterey, 20; Mount Hamilton, 21; Mountain View, 7; Nordhoff, 1; Pacheco Pass, 4; Pacheco Peak, 6; Palo Alto, 2; Paso Robles, 4; Upper Pescadero Creek, 14; Pillarcitos Lake, San Mateo County, 1; Pine Valley, near Tassajara Springs, 2; Point Pinos, 2; Portola, 242; Posts, 3; Pozo, 1; San Luis Obispo, 5; San Mateo, 2; San Pablo Creek, Contra Costa County, 1; San Rafael Mountains, 2;[a] near San Simeon, 4; Santa Barbara, 1; Santa Monica, 8; Santa Paula, 12; head of Santa Ynez River, 3;[a] Stanford University, 7; Soledad, 1; Sur, 2; Sur River, near mouth, 4; Tassajara Springs (6 miles south), 10; Tejon Canyon, 4; Three Rivers, 1; Ventura River, 7; Woodside, San Mateo County, 7; Zaca Lake, 2.[a]

PEROMYSCUS CALIFORNICUS INSIGNIS Rhoads. Southern Parasitic Mouse.

Peromyscus insignis Rhoads, Proc. Acad. Nat. Sci. Phila. (1895), pp. 33–34, Mar. 19, 1895.

Peromyscus californicus insignis Mearns, Bull. No. 56, U. S. Nat. Mus., p. 429, Apr. 13, 1907.

Type locality.—Dulzura, San Diego County, Calif.

Geographic distribution.—Upper and Lower Sonoran zones of the western valleys and foothills of southwestern California and thence south into northern Lower California.

Characters.—Similar to *Peromyscus californicus*, but slightly smaller and paler; skull smaller; molar teeth lighter.

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[a] Santa Barbara County.

Color.—Very similar to that of *P. californicus*, but averaging very slightly paler; rufous shades generally less intense; pectoral spot usually faint or absent; rufous at base of tail nearly obsolete; plumbeous undercolor paler; black-tipped hairs in middle of back less numerous.

Skull.—Similar to that of *P. californicus* but smaller; teeth smaller and lighter; anterior palatine foramina shorter; audital bullae very slightly smaller.

Measurements.—Average of 6 adult topotypes: Total length, 233 (220–245); tail vertebræ, 134 (124–140); hind foot, 25; ear from notch (dry), 20.3 (20–20.7).

Type specimen.—No. 8308 Collection Academy of Natural Sciences, Philadelphia; formerly No. 1308 Collection of S. N. Rhoads. ♂ adult. August 21, 1893. C. H. Marsh. Skin in good condition, underparts slightly greasy; skull with interparietal slightly indented and broken.

Remarks.—Typical *insignis* may be easily distinguished from typical *californicus* by its smaller size and light skull and teeth. The difference in color is slight, and therefore comparison should be confined to specimens absolutely comparable as regards both age and pelage. Fully adult specimens in winter pelage may be found that are practically indistinguishable. The first or young adult pelage of *insignis* is usually paler than in *californicus;* the worn and wearing summer pelage is also a trifle paler. However, it is possible to find specimens of each form so nearly alike in all pelages that it seems only safe to say that the tendency to a gray phase is stronger in *insignis*. *P. insignis* is more apt to be mistaken for *P. truei* than is *P. californicus*, but as stated under *californicus*, the dentition furnishes characters which are unmistakable.

Specimens examined.—Total number 251, from localities as follows:

California: Banning, 2; Cajon Pass, 7; Campo, 6; Coahuila Mountain, Riverside County, 1; Densmores, Riverside County, 1; Dulzura, 80; Glendora, 3; Grapeland, 3; Jacumba, 5; Jamul Creek, 2; La Jolla, 3; La Musa, 1; Mountain Spring, 2; Radec, 3; San Bernardino Peak, 5; San Bernardino Valley, 2; San Diego, 10; San Gabriel Mountains, 1; Santa Ana Mountains, 1; Santa Ysabel, 16; Temescal, 3; Twin Oaks, 18; Walker Basin, 1;[a] Witch Creek, 5.

Lower California: El Rayo, 2; Ensenada, 3; 20 m. east of Ensenada, 1; Juncolito Spring, 1; Las Encinas, 8; Nachoguero Valley, 22; Rancho Viejo, 2; Rosarito, 2; San Antonio, 6; San Pedro Martir Mountains, 2; San Quentin, 1; San Telmo, 4; San Ysidro Ranch, 1; Tecate Valley, 14; Trinidad, 1.

Key to subspecies of Peromyscus eremicus.

Habitat southern California.
  Paler; underparts usually white. East of coast ranges................*P. eremicus*
  Darker; underparts usually buffy. West of coast ranges............*P. e. fraterculus*

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[a] Collection of F. Stephens.

- Habitat mainland of Lower California.
  - Underparts usually white.
    - Paler; tall shorter; molars large. Northeastern---------------*P. eremicus*
    - Darker; tail longer; molars smaller. Southern---------------*P. e. eva*
  - Underparts usually buffy with a pectoral spot. Northwestern---*P. e. fraterculus*
- Habitat islands off the coast of Lower California.
  - Underparts with an ochraceous buff pectoral spot.
    - Size larger. Cedros Island---------------*P. e. cedrosensis*
    - Size smaller. Espiritu Santo Island---------------*P. e. insulicola*
  - Underparts without pectoral spot.
    - Size larger; upperparts chiefly ochraceous. Ceralbo Island. *P. e. avius*
    - Size smaller; upperparts chiefly grayish. Margarita Island. *P. e. polypolius*
- Habitat Arizona, New Mexico, Texas, and Mexico.
  - Tail more or less bicolor.
    - Color paler; underparts white---------------*P. eremicus*
    - Color darker; underparts white, often with a buffy pectoral spot---------------*P. e. anthonyi*
  - Tail dusky all around. Mexico---------------*P. e. phœurus*

PEROMYSCUS EREMICUS (BAIRD). DESERT MOUSE.

(Pl. III, fig. 11; pl. VI, fig. 9; pl. VII, fig. 4; pl. VIII, fig. 3.)

Hesperomys eremicus Baird, Mamm. N. Am., Pac. R. R. Repts., VIII, pp. 479–480, 1857.

Peromyscus eremicus Allen, Bull. Am. Mus. Nat. Hist., N. Y., VII, p. 226, June 29, 1895.

Peromyscus eremicus arenarius Mearns, Proc. U. S. Nat. Mus., XIX, p. 138, May 25, 1896.—Near El Paso, Tex.

Peromyscus merriami Mearns, Proc. U. S. Nat. Mus., XIX, p. 138, May 25, 1896. Sonoyta, Sonora, Mex.

Type locality.—Old Fort Yuma, Calif., opposite Yuma, Ariz.

Geographic distribution.—Lower Sonoran zone of southeastern California and northeastern Lower California east of the mountain ranges as far south as the vicinity of San Luis Bay; eastward to western Texas, and south to border States of eastern Mexico; northward along the Colorado River, at least to the vicinity of the mouth of the Little Colorado, also extending from the Colorado River along the Virgin Valley to St. George, Utah, and northwestward, crossing southern Nevada, to the Death Valley region of California.

General characters.—Size medium; tail decidedly longer than head and body, finely annulated and closely covered with short hairs, with very slight or no pencil at tip; ears relatively large and leafy, very thinly haired or almost naked; sole of hind foot naked to end of calcaneum, at least medially; pelage soft and silky; color generally shades of rather pale buff; black lining and grizzling exceedingly fine and uniformly distributed over upperparts, not concentrated medially.

Color.—Adult topotype No. 60172, collected April 3, still in winter pelage: Ground color of upperparts ochraceous buff; entire dorsum with a fine sprinkling of dusky, this not concentrated at any point, but uniformly distributed; a broad lateral line pure ochraceous buff; sides and top of head slightly grayish; tail dusky above, whitish below; underparts pure white or slightly tinged with yellowish or buff; traces of pectoral spot sometimes present. As the pelage wears, the black mixture in the upperparts becomes paler (brownish) and less distinct, and the ground color shows through more strongly. The lateral line is less sharply contrasted and gradually the entire upperparts become a dingy buff faintly sprinkled with cinnamon. Adolescent pelage: Similar in general to adult, but decidedly less buffy and more dusky, producing a general effect of pale drab; lateral line narrow.

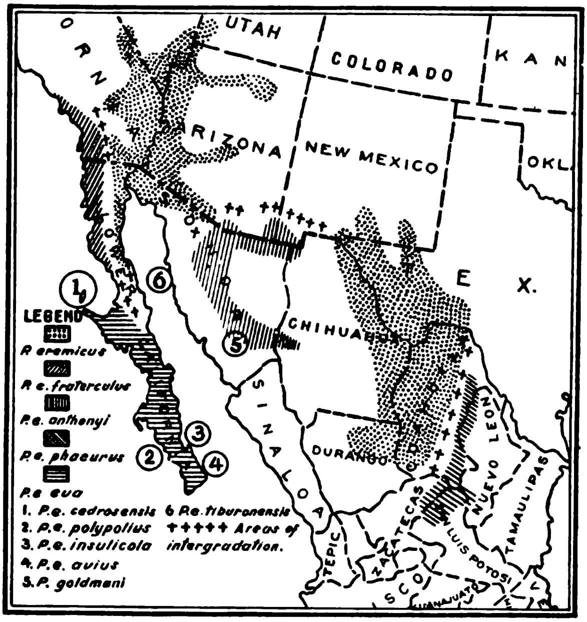

FIG. 11.—Distribution of *Peromyscus eremicus* and subspecies.

Skull.—Size medium; braincase rather high and somewhat elongate; infraorbital region well developed, much heavier than in *P. stephensi;* nasals rather broad, slightly concave near posterior endings; maxillaries always ending posterior to nasals; audital bullæ and anterior palatine foramina of moderate size.

Measurements.—Average of 10 adults from northeastern Lower California, near the type locality: Total length, 183 (172–192); tail vertebræ, 101 (94–108); hind foot, 20.5 (20–21); ear from notch (dry), 17.5 (17.3–17.8). Three topotypes, respectively: 202, 193, 186; 107, 103, 96; 21, 21, 20.

Type specimen.—The original description of this species was based on 6 specimens, 3 from Fort Yuma, Cal., and 3 from Colorado Bottom, California, an indefinite locality, doubtless very near Yuma. Three of these are still in the U. S. National Museum in more or less imperfect condition. No. $\frac{1581}{2410}$, which, being the first mentioned, might naturally be considered the type, is represented by fragments of the skull only, the mandibular rami, a portion of one maxillary, and 5 loose teeth. The skin evidently has been lost or mislaid since Baird's work was done. No. 2575, which is in effect the type, is still preserved in alcohol and is in fairly good condition, having lost but a small amount of hair on the sides and middle of the belly. Its skull has been removed and is practically perfect; the teeth are entirely unworn, indicating that the animal was scarcely adult. The third existing specimen, No. 1334, from Colorado Bottom, is a dry skin, somewhat distorted, but exhibiting the characters of the species very well; the fourth, from the same locality, is at present in the Museum of Comparative Zoology, Cambridge, Mass. If Fort Yuma be considered the type locality of *P. eremicus*, and there seems to be no reason why it should not, the above-mentioned alcoholic specimen No. 2575 becomes the type to all intents and purposes.

Remarks.—Typical *Peromyscus eremicus* occupies a comparatively extensive range in southern California, Arizona, New Mexico, and adjoining parts of Mexico, and is characteristic of the Lower Sonoran zone in this region. About the periphery of this range it intergrades with several more or less marked subspecies. More slightly characterized forms not recognized by name occur in several restricted areas, and throughout the range there are occasional slight variations in shade of color. It is easily distinguishable from the other species of the region, not only by its dentition, but by its long, terete, untufted tail and naked heels. It is very similar in color to *P. stephensi* but that species is smaller and has a penicillate tail. It does not undergo marked changes of pelage, and it molts in the same manner as *P. californicus*, of which it is scarcely more than a pale miniature. The form called *P. eremicus arenarius* appears to be too slight for recognition by name. A good series from the Franklin Mountains, Texas, near the type locality of *arenarius* reveals not the slightest difference in color from typical *eremicus* in exactly corresponding pelage. The only character is an exceedingly slight average decrease in the size of the ears. Another incipient form occurs in southern Utah, Nevada, and the Panamint and Death Valley region of California. The so-called *P. merriami* is, indeed, larger than typical *eremicus*, or at least larger than the majority of specimens from the habitat of typical *eremicus*, but only slightly larger, and not in the least different otherwise. The larger specimens of a series from one locality, Sonoyta, have been selected and called *merriami*, while the remaining smaller ones are unquestioned *eremicus*. Among the ten specimens identified by the original describer as *merriami* absolute uniformity in size does not obtain, or in other words there is a gradation from the smallest *eremicus* to the largest '*merriami*.' At other localities throughout the range of *eremicus* occasional specimens have been taken which are larger than the average and about the size of the Sonoyta specimens. Undeniably there are more large individuals from Sonoyta than from any other locality, but it seems too much of an assumption that they are specifically distinct. Specimens from Calamahue, Yubay, and neighboring localities in northeast Lower California are tentatively referred to *eremicus* although their slightly longer tails and creamy underparts seem to indicate a decided tendency toward *P. e. eva.*

Specimens examined.—Total number 824, from localities as follows:

Arizona: Adonde, 11; Beale Spring, 2; Big Sandy Creek, 2; Bill Williams River, 2; Colorado River at Boundary Monument No. 204, 16; Dolan Spring, 4; Ehrenberg, 1; Fort Grant, 7; Fort Huachuca, 8 (approaching *anthonyi*); Fort Lowell, 3; Fort Mohave, 4; Gila City, 9; Grand Canyon, 12; Granite Mountains, near Tule Wells, 1; Harper Ferry, 5; La Osa, 11; Little Meadows, 2; Mineral Park, 4; Mud Spring, 15, Nortons, 2; Painted Desert, 1; Phoenix, 2; San Pedro River, 1; Tinajas Altas, 9; Tucson, 1; Mountains near Tucson, 5; Tule Wells, 2; Willow Spring, 1; Yuma, 7.

California: Banning, 11; Barstow, 19; Big Laguna, 1; Colorado Bottom, 2; Daggett, 1; Death Valley, 3; Fort Yuma, 13; Furnace Creek, 5; Grapevine Ranch, 8; La Puerta, 10; Mohave Desert, east of Morongo Valley, 2; Morongo Pass, 10; Needles, 6; New River, 1; Oro Grande, 1; Palm Groves, 6; Palm Springs, 47; Panamint Mountains, 3; Panamint Valley, 36; Pilot Knob, 5; Providence Mountains, 9; Resting Springs, 59; San Felipe Canyon (approaching *fraterculus*), 11; San Felipe Valley, 1; 12-mile Spring, 2; Vallecitos, 2; Victorville, 1;[a] Warrens Well, 2; Whitewater, 8.

Nevada: Amargosa River, 4; Ash Meadows, 28; Bunkerville, 2; Charleston Mountains, 6; Colorado River, Lincoln County, 2; Pahrump Valley, 32; St. Thomas, 1; Vegas Valley, 6.

New Mexico: Carlsbad, 5; Jarilla, 1; Organ Mountains, 7; San Andres Mountains, 6; Tularosa, 10; Mal Pais Spring, 25 miles north of Tularosa, 3.

Texas: Boquillas, 1; Chinate Mountains, 1; Comstock, 2; East Painted Cave, 1; Franklin Mountains, near El Paso, 19; Marfa, 10; near El Paso, 21; Langtry, 2; Presidio County, 3; Sierra Blanca, 2; Terlingua, 1.

Utah: St. George, 7; Santa Clara, 9.

MEXICO:

Chihuahua: Chihuahua, 31; Escalon, 10; near Fort Bliss, Tex., 1; Santa Rosalia, 4; Torreon, 1.

Coahuila: Carneros, 2 (aberrant); Jaral, 8; Jimulco, 6 (approaching *phæurus*); Monclova, 8.

Durango: Inde, 1.

Lower California: Agua Dulce, 1;[b] Black Mountain, 1; Calamahue, 4;[b] Cocopah Mountains, 6; Esperanza Canyon, 12 (approaching *fraterculus*); Gardner Lagoon, 2; Hardy River, 5; Matomi, 5; Palomar, 4; Parral, 6; The Remada, 6; Rosarito Divide, 1; San Francisquito, 16;[b] Seven Wells, 1; Yubay, 5.[b]

Nuevo Leon: Sierra Encarnacion, 1 (aberrant).

Sonora: Cerro Blanco, 3; Poso de Luis, 6; Providencia Mines, 11; Quitobaquita, 14; Sonoyta, 15.

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[a] Collection of J. Grinnell. [b] Approaching *P. e. eva.*

PEROMYSCUS EREMICUS FRATERCULUS (MILLER).

Vesperimus fraterculus Miller, Am. Nat., XXVI, pp. 261–263, March, 1892.

Sitomys eremicus fraterculus Rhoads, Am. Nat., XXVII, p. 833, Sept., 1893.

Sitomys herroni Rhoads, Am. Nat., XXVII, pp. 832–833, Sept., 1893.—Reche Canyon, San Bernardino County, Calif.

Sitomys herroni nigellus Rhoads, Proc. Acad. Nat. Sci. Phila., pp. 257–258, Oct. 23 1894.—W. Cajon Pass, San Bernardino County, Calif.

[*Peromyscus*] *fraterculus* Trouessart, Catal. Mamm. pt. III, p. 515, 1897.

Peromyscus eremicus fraterculus Allen, Bull. Am. Mus. Nat. Hist., N. Y., X, p. 154, 1898.

Peromyscus homochroia Elliot, Field Col. Mus., Chicago, Zool. Ser., III, pp. 158–9, Apr., 1903.—San Quentin, Lower California.

Type locality.—Dulzura, San Diego County, Calif.

Geographic distribution.—Extreme southwestern California, west of the mountains from the vicinity of Los Angeles south to northwestern Lower California.

General characters.—Similar to *P. eremicus*, but decidedly darker: more reddish brown in summer, more blackish in winter; underparts creamy or buff instead of pure white; tail somewhat longer.

Color.—Cotype in winter pelage: Ground color of upperparts cinnamon rufous richly sprinkled with black, which is somewhat concentrated in middle of back; head with more or less grayish, particularly in postorbital region; underparts creamy white with a small rufous pectoral spot. No. 34086, San Diego, Calif., in slightly worn 'left-over' winter pelage: Ground color cinnamon-rufous, as in winter pelage; tips of hairs not black, but brown or brownish dusky, producing a more rufescent general effect than in the winter pelage.

Skull.—Practically as in *P. eremicus*.

Measurements.—Average of 3 specimens—2 cotypes and 1 topotype: Total length, 191; tail vertebræ, 112; hind foot, 20.

Type specimen.—A male and a female type were designated by the describer of this species in accordance with the one-time idea that this was desirable. At present these may be considered as cotypes of equal importance, or the male may be selected for a type, as has been done frequently by ornithologists in similar cases. Both specimens, Nos. $\frac{1817}{1044}$ (♂) and $\frac{1155}{962}$ (♀), formerly in the private collection of Gerrit S. Miller, jr., are now in the British Museum.

Remarks.—*P. e. fraterculus* is a very well-marked subspecies. Typical specimens are so much deeper colored than *eremicus* that they are recognizable at a glance. It is geographically separated from *eremicus* by a more or less continuous range of mountains, in the interdigitating canyons of which intermediate specimens are found, some nearer to *fraterculus* and others referable to *eremicus*. Among such intermediates are those from Reche Canyon which have been called '*herroni*' and which are easily referable to *fraterculus* unless such slight intermediates without definite range are to be recognized. The type of *herroni* is nearer *fraterculus* than most others from the San Bernardino Mountains, since it has the entire underparts suffused with buff, a condition never found in typical *eremicus*. '*P. h. nigellus*' appears to be identical with *fraterculus*. *P. e. fraterculus* ranges south along the coast of Lower California and meets *P. e. eva*, the specimens called '*propinquus*' being almost exact intermediates.

Specimens examined.—Total number 230, from localities as follows:

California: Aguanga, 3; Burbank, 1; Cajon Pass, 4; Campo, 3; Chihuahua Mountains, San Diego County, 1; Dulzura, 10; Glendora, 1; Hueneme (9 m. east), 2; Jamul Creek, near El Nido, 13; Jacumba, 11; Lytle Creek, 1 (approaching *eremicus*); Mountain Spring, 11 (approaching *eremicus*); Nordhoff, 1; Radec, 1; Reche Canyon, 10 (approaching *eremicus*); Redlands, 1; Riverside, 10; Rose Canyon, San Diego Co., 4; San Bernardino, 2; San Bernardino Valley, 19 (approaching *eremicus*); San Diego, 8; San Fernando, 5; Santa Ysabel, 8; Summit, Coast Range, San Diego County, 1; Temescal, 2; Mouth Tia Juana River, 2; Twin Oaks, 2; West Riverside, 2.

Lower California: Canyon Salado, 1; Ensenada, 4; Las Encinas, 2; Nachoguero Valley, 1; Piñon, 2; Rancho Viejo, 3; San Antonio, 7; San Antonio River, 8; San Fernando, 11; San Matias Spring, 9; San Quentin, 19; Socorro, 1; Tecate Valley, 14; Trinidad, 8; Valladores, 1.

PEROMYSCUS EREMICUS CEDROSENSIS ALLEN. CERROS ISLAND MOUSE.

Peromyscus cedrosensis Allen, Bull. Am. Mus. Nat. Hist., N. Y., X, pp. 154–155, Apr. 12, 1898.

Type locality.—Cerros Island, off west coast of central Lower California.

Geographic distribution.—Cerros Island, Lower California.

General characters.—Similar to *P. e. eva;* color averaging slightly darker and richer; paler than in *P. e. fraterculus;* ears smaller; skull slightly larger with longer nasals.

Color.—Similar to that of *fraterculus*, but averaging paler; lateral line rather broad and conspicuous ochraceous buff; pectoral spot usually present; underparts buffy; tail slightly lighter below than above.

Skull.—Much as in *P. e. fraterculus*, but with rostrum and nasals averaging longer and more slender; rostrum somewhat depressed; braincase high and rounded.

Measurements.—Average of 8 topotypes: Total length, 193 (181–200); tail vertebræ, 110 (106–114); hind foot (dry), 20; ear from notch (dry), 16 (15.5–16.5).

Type specimen.—No. $\frac{13583}{11932}$ American Museum of Natural History, New York. ♂ adult. April 1, 1897. A. W. Anthony. Skin in good condition; skull badly broken, lacking all the anterior part of the cranium; rostrum, nasals, and upper molars in good condition.

Remarks.—This insular form is almost identical in color with the mainland intermediates between *fraterculus* and *eva.* The material representing it is in rather poor condition and it is difficult to observe any characters of importance. It is perhaps nearer in color to *fracterculus* than to *eva*, since its underparts are buffy with a well-marked pectoral spot. The color of the upperparts is intermediate. The rather elongate rostrum is perhaps the best character observable in the material at hand.

Specimens examined.—Total number 11, all from the type locality.

PEROMYSCUS EREMICUS EVA THOMAS.

Peromyscus eva Thomas, Ann. & Mag. Nat. Hist., Lond., Ser. 7, I, pp. 44–45, Jan., 1898.

Peromyscus eremicus propinquus Allen, Bull. Am. Mus. Nat. Hist., N. Y., X, p. 154, Apr. 2, 1898.—San Pablo Point, lat. 27° 20′ N., Lower California.

Type locality.—San José del Cabo, Lower California, Mexico.

Geographic distribution.—Lower Sonoran zone of the central and southern part of the peninsula of Lower California, from Cape St. Lucas north to the vicinity of latitude 29° N., meeting the ranges of *P. eremicus* and *P. e. fraterculus.*

Characters.—Similar in general to *P. e. fraterculus*, but tail longer; pelage shorter and slightly harsher; color more rufescent; ears averaging slightly smaller; general appearance of a small *Oryzomys;* skull essentially as in *P. eremicus.*

Color.—Unworn pelage: Upperparts ochraceous buff copiously mixed with fine dusky lines uniformly distributed, except on lower sides; general effect of back between isabella color and cinnamon; lateral line usually distinct only from axillary region to hip, often widened on middle of side to a broad area of clear ochraceous buff; head, including nose, cheeks, and orbital region pale gray tinged with ochraceous; a narrow dusky orbital ring scarcely extending beyond eyelids; ears pale brownish, almost naked; underparts pure creamy white without pectoral spot; tail usually dusky above and slightly paler below, often quite uniform blackish all around; feet white, tarsal joints marked with dusky. Worn pelage: General effect of both sides and back bright ochraceous buff scarcely at all modified by the slight mixture of dusky cinnamon.

Skull.—Essentially as in *P. eremicus* and *P. e. fraterculus*, but averaging smaller with a smaller, narrower braincase and weaker molars.

Measurements.—Average of ten adults from Santa Anita: Total length, 198 (185–218); tail vertebræ, 114 (100–128); hind foot, 20.4 (20–21); ear from notch (dry), 16.6 (15.6–17.2).

Type specimen.—No. 98.3.1.88 British Museum. ♂ adult. July 29, 1896. Dane Coolidge. Specimen in good condition.

Remarks.—This is one of the most strongly marked forms of the *eremicus* series. Its resemblance to a small *Oryzomys* or some of the Mexican species of *Reithrodontomys*, as originally noted by Doctor Thomas, is quite striking. However, it can be ranked only as a subspecies of *eremicus*, for complete intergradation is found both with typical *eremicus* and with *P. e. fraterculus*. The supposed relationship to *aztecus* hazarded by Thomas after Coues is therefore out of consideration. Specimens from Cape St. Lucas northward to the vicinity of latitude 28° north are quite uniform in color and preserve the same general characters, the only important variation being in size. In this respect there is considerable variation in every series. The largest specimens are from Aguaje de Santana, from which locality the largest individual presents the following measurements: Total length, 228; tail vertebræ, 138; hind foot, 22. Other specimens from the same and neighboring localities do not differ materially from specimens of *eva* from the type locality. The supposed form called '*P. e. propinquus*' proves to be almost exactly intermediate between *eva* and *fraterculus*. Such a form can not be characterized and it can not be restricted to a definite range. It is placed under *eva* rather than *fraterculus* chiefly on account of its long tail. The difficulty of properly allocating such a form is well shown by a series of 6 specimens from San Andres. Three of these have white underparts without pectoral spots as in *eva*, while the remaining three have buffy underparts and pectoral spots as in *fraterculus*. The measurements, cranial characters, and color of upperparts are exactly intermediate. Specimens from Yubay, Calamahue, and San Francisquito apparently are intermediate between *eva* and typical *eremicus* and on the whole seem nearer *eremicus*. A skin without skull from Carmen Island may represent an undescribed form.

Specimens examined.—Total number 100, from localities as follows:

Lower California: Aguaje de Santana, 6; Calmalli, 2; Carmen Island, 1; Cape St. Lucas, 2; Comondu, 5; El Potrero, 3; La Paz, 1; Matancita, 2; Paso Hondo, 1; Pescadero, 1; Playa Maria Bay, 2 (approaching *fraterculus*); San Andres, 6 (approaching *fraterculus*); San Ignacio, 4; 20 m. west of San Ignacio, 9; San Jorge 6; San Jose del Cabo, 9; San Pablo Point, 4; Santa Anita, 23; Santa Clara Mountains, 2; Sierra Laguna, 4; Tres Pachitas, 4; Turtle (or San Bartolome) Bay, 3.

PEROMYSCUS EREMICUS INSULICOLA subsp. nov.

Type from Espiritu Santo Island, off east coast of southern Lower California, Mexico. No. 147010 U. S. National Museum, Biological Survey Collection. ♂ adult. Feb. 9, 1906. E. W. Nelson and E. A. Goldman.

Geographic distribution.—Confined to Espiritu Santo Island, Lower California.

Characters.—Similar to *P. e. eva*, but color slightly darker; pectoral region with an elongate stripe of ochraceous buff.

Color.—Much as in *P. e. eva*, but somewhat darker throughout; upperparts a deeper shade of ochraceous buff and mixture of dusky more copious, producing a more vinaceous general effect; underparts creamy white with a sharply defined elongate pectoral stripe extending backward to front of abdomen; tail chiefly dusky, scarcely lighter below than above.

Skull.—About as in *P. e. eva;* narrower and lighter, with weaker molars than in *avius.*

Measurements.—Two adult topotypes, respectively: Total length, 196, 200; tail vertebræ, 115, 113; hind foot, 20, 19.5; ear from notch (dry), 16.5, 16.7.

Remarks.—Although but few specimens from Espiritu Santo Island are available, they are so obviously different from *P. e. eva* of the adjacent mainland that it seems necessary to name them. The prominent pectoral spot and slightly darker upperparts distinguish them at once from typical *eva*, but in color they are very similar to specimens which are intermediate between *eva* and *fraterculus.* From these, however, they differ in having smaller skulls and weaker molars.

Specimens examined.—Total number 3, all from the type locality.

PEROMYSCUS EREMICUS AVIUS[a] subsp. nov.

Type from Ceralbo Island, off east coast of southern Lower California, Mexico. No. 147024 U. S. National Museum, Biological Survey Collection. ♀ adult. Feb. 13, 1906. E. W. Nelson and E. A. Goldman.

Geographic distribution.—Confined to Ceralbo Island, Lower California.

Characters.—Similar to *P. e. eva*, but size slightly larger; ears smaller; color of underparts buffy instead of pure white; skull rather larger, with molar teeth relatively heavy.

Color.—Upperparts essentially as in *P. e. eva*, chiefly ochraceous buff mixed wth fine lines of dusky, averaging slightly darker and richer than in *eva;* entire underparts except throat and inguinal region cream buff; tail quite definitely bicolor, blackish brown above, dull whitish below.

Skull.—Similar to that of *P. e. eva*, but larger and heavier; interparietal rather larger; molar teeth decidedly larger and heavier, about equaling those of *fraterculus.*

Measurements.—Average of 10 adult topotypes: Total length, 194 (186–209); tail vertebræ, 105 (100–116); hind foot, 21.6 (21.5–22); ear from notch (dry), 14.5 (13.4–16).

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[a] *avius*, out of the way: remote: unfrequented.

Remarks.—The principal characters distinguishing this form are its rather large size, small ears, buffy instead of white underparts, and large teeth. It is represented by a good series in which these characters are quite constant. Although the underparts are largely buffy, there is no indication of a pectoral spot. This form, therefore, differs from *insulicola* of Espiritu Santo Island in this respect as well as in its larger skull and teeth, etc.

Specimens examined.—Total number 17, all from the type locality.

PEROMYSCUS EREMICUS POLYPOLIUS subsp. nov.

Type from Margarita Island, off west coast of southern Lower California. No. 146074 U. S. National Museum, Biological Survey Collection. ♂ adult. Nov. 30, 1905. E. W. Nelson and E. A. Goldman.

Geographic distribution.—Confined to Margarita Island, Lower California.

Characters.—Somewhat similar to *P. e. eva*, but color much more grayish; skull with rostrum more depressed; braincase shorter and more inflated.

Color.—Unworn pelage: Upperparts from head to rump mixed gray, dusky, and pinkish buff, gray predominating on head, shoulders, and back and buffy becoming stronger toward rump; upper sides like back; lower sides broadly pinkish buff or pale ochraceous buff, this being reduced to a narrow streak on lower cheeks; underparts pale cream buff, never so nearly white as in *P. e. eva;* pectoral spot rarely developed; feet white, tarsal joints dusky, tail dusky above, dull whitish gray often mixed with dusky below. Worn pelage: Less grayish than unworn pelage; general effect of upperparts pinkish buff considerably modified by dusky and gray.

Skull.—Similar in general to that of *P. e. eva*, but rostrum more slender and more depressed; infraorbital part of zygomata weaker and more compressed; braincase relatively shorter, broader, deeper, and more inflated; molars slightly larger.

Measurements.—Average of 10 adult topotypes: Total length, 192 (183–200); tail vertebræ, 109.5 (100–117); hind foot, 19.5 (19–20); ear from notch (dry), 15.7 (14.6–16.8).

Remarks.—This form, like *margaritae* of the *maniculatus* group, is well distinguished from its relatives of the mainland. Its derivation from *P. e. eva* is scarcely to be doubted, however, and variation is occasionally sufficient to nearly or quite cover the characters shown by the majority of specimens. The gray color is quite distinctive, the head being nearly of the same gray color as usual in the *eremicus* group, but this color is continued on the shoulders and back, and the ochraceous is largely confined to the rump and lower sides. The back is a peculiar ‘peppery’ mixture of gray and dusky with slight tinges of buff.

Specimens examined.—Total number 22, all from the type locality.

PEROMYSCUS EREMICUS ANTHONYI (MERRIAM). ANTHONY DESERT MOUSE.

Hesperomys (*Vesperimus*) *anthonyi* Merriam, Proc. Biol. Soc. Wash., IV, pp. 5–7, Apr. 15, 1887.

[*Peromyscus*] *anthonyi* Trouessart, Catal. Mamm., Pt. III, p. 517, 1897.

Peromyscus eremicus anthonyi Mearns, Bull. No. 56, U. S. Nat. Mus., p. 438, Apr. 13, 1907.

Type locality.—Camp Apache, Big Hachita Mountains, Grant County, N. Mex.

Geographic distribution.—Extreme southeastern Arizona and southwestern New Mexico in the vicinity of the Mexican boundary line and south through the State of Sonora west of the Sierra Madre to northern Sinaloa.

General characters.—Very similar to *P. eremicus*, but darker and more richly colored, but not so extreme in this respect as *P. e. fraterculus;* ears very slightly smaller; pectoral spot usually present.

Color.—No. 22529 from Deming, N. Mex. Winter pelage (Dec. 2): Ground color and broad lateral line rich ochraceous buff; entire upperparts heavily sprinkled with black, this not concentrated medially, but uniformly distributed; head grayish drab, suffused with buff, particularly on cheeks; underparts creamy white, except a prominent ochraceous buff pectoral spot,[a] extending from breast between forelegs almost to middle of belly; tail blackish above and paler below, but not sharply bicolor; feet creamy white, 'ankles' dusky. Worn pelage: As in *P. eremicus*, but darker and duller. Immature: Much darker and more decidedly blackish than in *eremicus.*

Skull.—As in *P. eremicus.*

Measurements.—One adult male from Deming, N. Mex.: Total length, 197; tail vertebræ, 105; hind foot, 21. Average of 10 adults from Alamos, Sonora, Mexico: Total length, 194 (188–202); tail vertebræ, 108 (102–113); hind foot, 21.5 (21–22).

Type specimen.—No. $\frac{2833}{3841}$, Collection of C. Hart Merriam. ♂ immature. Collected May 10, 1886, by A. W. Anthony. Skin and skull in good condition, but showing no subspecific characters on account of immaturity.

Remarks.—The type locality of this subspecies, which was described before Mexican specimens had been collected, is unfortunately near the northern limit of the form, where it is beginning to merge with true *eremicus.* It reaches its greatest differentiation in southern Sonora, but at best is only slightly characterized by its richer and more blackish color, and although separated geographically, it closely resembles *fraterculus.* Skulls from different parts of its range vary slightly in size, but show no constant difference from those of typical *eremicus.*

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[a] Such a pectoral spot is very frequently but not always present.

Specimens examined.—Total number 121, from localities as follows:

Arizona: [a] Calabasas, 1; Fairbank, 1; Fort Verde, 8; San Bernardino Ranch, 2; Tombstone, 1; Tonto Creek, 2; Tubac, 4.
Chihuahua: Near Batopilas, 12.
New Mexico:[a] Boundary line, 100 miles west of El Paso, 11; Camp Apache, Grant County, 5; Carrizalillo, 1; Deming, 5; Dog Spring, Grant County, 2; Florida Mountains, 1; Hachita, 4; Lat. 31° 47′, long. 30° 15′, 13; Redrock 1; Silver City 1.
Sonora: Alamos, 15; Camoa, 4; Guaymas, 2; Hermosillo, 17; Magdalena, 2; Oposura, 2.
Sinaloa: Culiacan, 4.

PEROMYSCUS EREMICUS TIBURONENSIS (MEARNS). TIBURON DESERT MOUSE.

Peromyscus tiburonensis Mearns, Proc. U. S. Nat. Mus. XIX, pp. 720–721, July 30, 1897.

Type locality.—Tiburon Island, off coast of Sonora, Mexico.

Geographic distribution.—Tiburon Island and immediately adjacent mainland.

General characters.—Decidedly smaller than *P. e. anthonyi;* skull slightly different; otherwise similar.

Color.—Darker than *P. eremicus*, about as in *P. e. anthonyi.* Type specimen with pure white underparts and no pectoral spot.

Skull.—Similar to that of *P. eremicus*, but smaller; rostrum more depressed; braincase relatively deeper; teeth and audital bullæ small, about in proportion to size of skull.

Measurements.—Dry skin of type: Total length, 170; tail vertebræ, 92; hind foot, 18; ear from notch, 15.

Type specimen.—No. 63186, U. S. National Museum. ♂ adult. Dec. 25, 1895. J. W. Mitchell. The skin of the type is a renovated specimen in fair condition. The tail vertebræ have not been removed and a small patch of hair is gone from the left side. The skull is perfect, except for one slightly broken zygoma.

Remarks.—Small size seems to be the only important character distinguishing this form from *P. e. anthonyi.* The tail of the type has the appearance of being more hairy than in most specimens from the mainland, but this may be due to its being a midwinter specimen, added to the fact that the skin of the tail is somewhat shriveled around the vertebræ instead of being smoothly stretched over a wire. Specimens from the mainland of Mexico on the Coastal Plain are indistinguishable from the type of *tiburonensis.* One, from Ortiz, though about the same size as *tiburonensis*, has a small pectoral spot as in *anthonyi.*

Specimens examined.—Total number 4, from localities in Mexico as follows:

Sonora: Batamotal, 2; Ortiz, 1; Tiburon Island, 1.

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[a] Among these many approach *eremicus*.

PEROMYSCUS EREMICUS PHÆURUS Osgood.

Peromyscus eremicus phœurus Osgood, Proc. Biol. Soc. Wash., XVII, pp. 75–76, Mar. 21, 1904.

Type locality.—Hacienda la Parada, San Luis Potosi, Mexico.

Geographic distribution.—Middle part of the Mexican tableland in the States of San Luis Potosi, Zacatecas, and Nuevo Leon.

General characters.—Similar to *P. eremicus*, but darker, with tail uniform blackish brown above and below instead of decidedly bicolor, as in *eremicus*, or indistinctly bicolor, as in some specimens of *P. e. anthonyi.*

Color.—Similar in general to *eremicus*, but shades of buff deeper and entire upperparts much more heavily mixed with black; underparts, except tail, white; pectoral spot not present; tail blackish brown above and below, this most evident in winter pelage, when the hairiness of the tail is best developed; feet white, 'ankles' dusky.

Skull.—Practically as in *eremicus* and *anthonyi.*

Measurements.—Average of 9 adults: Total length, 189 (176–195); tail vertebræ, 98 (92–103); hind foot, 21; ear from notch (dry), 16 (15.2–16.8).

Type specimen.—No. 50438 U. S. National Museum, Biological Survey Collection. ♀ adult. Aug. 20, 1892. E. W. Nelson and E. A. Goldman. Specimen in good condition.

Remarks.—This form is the southernmost representative of the *eremicus* group. Its range is practically continuous with that of *eremicus*, which extends from west Texas down through Chihuahua, but it is cut off by mountain ranges from *anthonyi*, which, curiously, it most closely resembles. The extreme form of *anthonyi* from southern Sonora occasionally has the distal third of the tail black all around, and thus very much resembles *phœurus.* This is probably an accidental parallelism, as shown also by some specimens of *fraterculus* which are strikingly like *anthonyi*, although there is even greater isolation in this case.

Specimens examined.—Total number 28, from localities as follows:

Coahuila: Sabinas, 3; Saltillo, 2.
Nuevo Leon: Doctor Arroyo, 5.
San Luis Potosi: Ahualulco, 2; Hacienda La Parada, 7; Jesus Maria, 7.
Zacatecas: Canitas, 2.

PEROMYSCUS GOLDMANI Osgood.

Peromyscus goldmani Osgood, Proc. Biol. Soc., Wash., XVII, p. 75, Mar. 21, 1904.

Type locality.—Alamos, Sonora, Mexico.

Geographic distribution.—Known only from the type locality.

Characters.—Similar in general to *P. eremicus anthonyi;* size larger (hind foot 24 in type); pelage somewhat coarser; color more fulvous and more uniform; heel slightly hairy; tail long and cylindrical, covered with short hairs; skull relatively heavy and rather elongate.

Color.—Entire upperparts and sides ochraceous buff, finely mixed with black, much darker and richer than in *anthonyi*, and without the grayish cast usually so characteristic of the *eremicus* group; underparts creamy white, with a small ochraceous buff pectoral spot.

Skull.—Larger, longer, and narrower than in *eremicus* or *anthonyi;* braincase relatively much narrower; nasals longer and more compressed posteriorly; interorbital constriction narrow; bony palate rather short.

Measurements.—Type: Total length, 217; tail vertebræ, 117; hind foot, 24; ear, from notch (dry), 18.2.

Type specimen.—No. 96340 U. S. National Museum, Biological Survey Collection. ♀ adult. Dec. 19, 1898. E. A. Goldman. Specimen in good condition.

Remarks.—In color and size this species resembles *P. spicilegus* closely, and, without examination of its skull and teeth, its affinity to the *eremicus* group would scarcely be suspected.

Specimens examined.—Total number 2, both from the type locality.

Subgenus BAIOMYS True.

Baiomys True. Proc. U. S. Nat. Mus., XVI, p. 758, Feb. 7, 1894.

Type.—*Hesperomys* (*Vesperimus*) *taylori* Thomas (=*Peromyscus taylori*).

Characters.—Size very small, hind foot usually less than 17; tail decidedly shorter than head and body; ears relatively small and slightly more rounded than in subgenus *Peromyscus;* soles of hind feet almost or quite naked; plantar tubercles 6; coronoid process of mandible large, broad, and strongly recurved; anterior palatine foramina long and usually ending posterior to the plane of the front of the first molars; posterior palatine foramina about opposite middle of $\underline{\text{m}}$ 2; interorbital space relatively wide, usually more than half as wide as widest part of frontals; upper incisors relatively heavy; accessory cusps of m 1 and $\underline{\text{m}}$ 2 very small and not obvious in transverse view until a late stage of wear; inner reëntrant angle of $\underline{\text{m}}$ 3 relatively small and usually obliterated at an early stage of wear.

Species.—*P. taylori* and *P. musculus.*

Remarks.—The members of this group are always recognizable by their small size. However, the discrepancy between them and the smallest forms (*pallescens* and *polionotus*) of the subgenus *Peromyscus* is very slight. The most decided character of *Baiomys* appears in the coronoid process of the mandible, which is nearly or quite as well developed as in *Onychomys*, but this too is rather variable in *Peromyscus.* The skull is characterized by slight peculiarities, none of which seem of more than specific value. The dentition is nearly as in typical *Peromyscus*, the deviation from the normal type being no greater than in various specific groups. The plantar tubercles number 6, as in *Peromyscus*, but they appear to be less variable in shape (see Pl. VIII, fig. 7).

Key to species of Subgenus Baiomys.

Size smaller; hind foot 13–15; greatest length of skull usually less than 20,
P. taylori. (p. 253)
Size larger; hind foot 15–17; greatest length of skull usually 20 or more,
P. musculus (p. 257)

Key to subspecies of Peromyscus taylori.

Habitat Texas and northeastern Mexico.
  Color more grayish………………………………*P. taylori*
  Color more sooty………………………………*P. t. subater*
Habitat western and central Mexico.
  Color paler, general effect broccoli brown or fawn………*P. t. paulus*
  Color darker, chiefly sooty or very dark brown………*P. t. analogus*

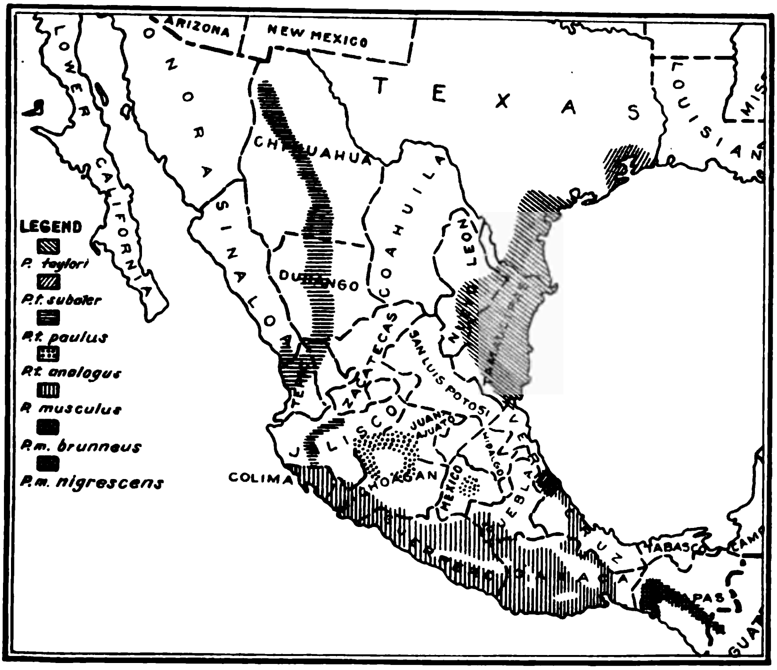


FIG. 12.—Distribution of the subgenus *Baiomys.*

PEROMYSCUS TAYLORI (THOMAS).

(Pl. IV, fig. 10; pl. VIII, fig. 7.)

Hesperomys (*Vesperimus*) *taylori* Thomas, Ann. & Mag. Nat. Hist., ser. 5, XIX, p. 66, Jan., 1887.

Peromyscus (*Baiomys*) *taylori* Allen, Bull. Am. Mus. Nat. Hist., N. Y., VIII, p. 65, Apr. 22, 1896.

Baiomys taylori Mearns, Bull. No. 56, U. S. Nat. Mus., p. 381, Apr. 13, 1907.

Type locality.—San Diego, Tex.

Geographic distribution.—Southern Texas from the vicinity of Matagorda Bay westward to Bexar County and thence south to the Rio Grande; south into Nuevo Leon and thence to southern Tamaulipas. Lower Sonoran zone.

Characters.—Size small (hind foot 13–15); tail much shorter than head and body; general color more grayish than in allied forms; skull smaller and lighter than in *P. musculus.*

Color.—Unworn pelage: Upperparts pale drab or écru drab rather heavily mixed with dusky, producing a general effect of hair brown on the back and broccoli brown on the sides; head and face about like sides; no orbital ring, spot at base of whiskers, nor obvious lateral line; underparts smoke gray washed with cream buff; feet smoke gray; tarsal joints slightly dusky; ears thinly clothed with grayish hairs, producing same general effect as main body color; tail rather indistinctly bicolor, dull dusky above, smoke gray below. Worn pelage: More brownish than unworn pelage; general effect of upperparts grayish isabella color or wood brown slightly darker in middle of back.

Skull.—Size very small, decidedly smaller than that of *P. musculus;* dorsal outline evenly arched; nasals short and broad, slightly exceeded by ascending branches of premaxillæ; interorbital space broad and rather sharp-angled; palatine slits long and nearly parallel-sided; audital bullæ moderate. (For general characters, see subgeneric diagnosis.)

Measurements.—Average of 7 adults from Brownsville, Tex.: Total length, 97 (87–110); tail vertebræ, 38 (34–45); hind foot, 14.3 (13.4–15); ear from notch (dry), 9 (8.8–10). Of 5 adults from Camargo, Tamaulipas: 110 (104–118); 44 (40–50); 14.7 (14.5–15).

Type specimen.—No. 87.11.24.1 British Museum.

Remarks.—This is the smallest species of the genus *Peromyscus* and one of the smallest of all rodents. It differs from *musculus*, the only other species of the subgenus, chiefly in its smaller size. Its subspecies are but slightly characterized, being in most respects, save shade of color, like the typical form. Although as yet there are gaps of considerable extent between the known ranges of the subspecies, the forms are so closely allied that there is little doubt of complete intergradation.

Specimens examined.—Total number 102, from localities as follows:

Nuevo Leon: Monterey, 1; Santa Catarina, 1.

Tamaulipas: Alta Mira, 2; Camargo, 5; Hidalgo, 7; Matamoras, 5; Victoria, 6.

Texas: Beeville, 1; Boerne, 3; Brownsville, 31; Matagorda, 4; Matagorda Peninsula, 7; Rockport, 1; San Antonio, 26; San Diego, 2.

PEROMYSCUS TAYLORI SUBATER Bailey.

Peromyscus taylori subater **Bailey, N. Am. Fauna No. 25, pp. 102–103, Oct. 24, 1905.**

Type locality.—Bernard Creek, near Columbia, Brazoria County, Tex.

Geographic distribution.—Coast region of southeastern Texas from the vicinity of Matagorda Bay eastward. Austroriparian zone.

Characters.—Similar to *P. taylori*, but darker and more sooty.

Color.—Unworn pelage: General effect of upperparts dark grayish brown or sepia, sometimes almost black in middle of back; sides usually showing more or less buffy; underparts cream buff to clay color, becoming slightly paler and more grayish on throat and chin; tail rather more distinctly bicolor than in *P. taylori.* Worn pelage: General effect of upperparts pale reddish sepia, slightly darker in middle of back.

Skull.—As in *P. taylori.*

Measurements.—Average of 7 topotypes: Total length, 99 (88–104); tail vertebræ, 39 (36–44); hind foot, 14.5 (14–15); ear from notch (dry), 9 (8–9.4).

Type specimen.—No. $\frac{32616}{44668}$ U. S. National Museum, Biological Survey Collection. ♀ adolescent. Feb. 25, 1892. W. Lloyd. Specimen in good condition.

Remarks.—This is a slight form differing from true *taylori* in its more sooty coloration. Intergradation with *taylori* apparently occurs in the vicinity of Matagorda Bay. The most extreme example (the type) is in unworn pelage and exceedingly dark, the middorsal region being almost black, but specimens in worn coat approach *taylori* more closely. The average difference in color, however, is considerable. At Richmond, Tex., Mr. Bailey (l. c.) found these mice "fairly common under the rich carpet of grass on the open prairie. Their tiny runways, leading from one little burrow to another, wound about over the surface of the ground among the plant stems and indicated habits so similar to those of *Microtus* that at first I thought I had discovered traces of a diminutive species of that genus."

Specimens examined.—Total number 15, from localities as follows:

Texas: Austin Bayou, near Alvin, 2; Bernard Creek, near Columbia, 7; Richmond, 4; Sour Lake, 1; Virginia Point, 1.

PEROMYSCUS TAYLORI PAULUS Allen.

Peromyscus paulus **Allen, Bull. Am. Mus. Nat. Hist., XIX, pp. 598–599, Nov. 14, 1903.**

Peromyscus allex **Osgood, Proc. Biol. Soc. Wash., XVII, pp. 76–77, Mar. 21, 1904.—Colima, Colima, Mexico.**

Type locality.—Rio Sestin, northwestern Durango, Mexico.

Geographic distribution.—Lower Sonoran and Arid Tropical parts of western Mexico, from central Chihuahua south and west through Durango, Sinaloa, and Jalisco to Colima.

Characters.—Size, proportions, and cranial characters about as in *P. taylori;* color averaging more brownish and more strongly tinged with fawn.

Color.—Similar in general to that of *P. taylori* but averaging less grayish. Unworn pelage: General effect of upperparts broccoli brown tinged with fawn color. Worn pelage: General effect of upperparts brownish fawn color or almost clear fawn color.

Skull.—Not definitely distinguishable from that of *P. taylori;* nasals possibly averaging slightly shorter.

Measurements.—Type: Total length, 108; tail vertebræ, 44; hind foot (dry), 14. Two adults from Durango, Durango: Total length 110, 110; tail vertebræ, 49, 43; hind foot, 15, 14; ear from notch (dry), 9.6, 9.8.

Type specimen.—No. 21165 American Museum of Natural History. New York. ♂ adult. April 15, 1903. J. H. Batty. Specimen in fair condition.

Remarks.—It is surprising that this form differs so slightly from *P. taylori.* The only distinguishing character is the fairly constant tendency toward pinkish fawn color. Specimens from Colima representing '*allex*' show very little of this fawn color, but differ so slightly that they seem scarcely worthy of recognition. The cranial characters vary slightly, and chiefly in size, specimens from Colima being quite the smallest examined. In color there is scarcely any difference from *musculus*, which, however, is decidedly larger.

Specimens examined.—Total number 70, from localities as follows:

Chihuahua: Balleza, 1; Casas Grandes, 1.
Colima: Colima, 10.
Durango: Durango, 3; Rancho Santuario, 2; Rio Sestin, 15; Rosario, 1; San Gabriel, 2.
Jalisco: Atemajac, 12; Etzatlan, 6.
Sinaloa: Mazatlan, 5; Rosario, 8.
Tepic: Acaponeta, 4.

PEROMYSCUS TAYLORI ANALOGUS subsp. nov.

Type from Zamora, Michoacan. No. 120261 U. S. National Museum, Biological Survey Collection. ♂ adult. Jan. 15, 1903. E. W. Nelson and E. A. Goldman.

Geographic distribution.—West central Mexico, from Jalisco and Michoacan eastward to the Valley of Mexico.

Characters.—Size, proportions, and cranial characters about as in *taylori* and *paulus;* color decidedly darker; feet and toes usually more or less dusky.

Color.—Much as in *nigrescens* and *subater*, decidedly darker than in *paulus*, *musculus*, etc. Unworn pelage: General effect of sides, sepia; of back, blackish sepia; underparts slaty gray, heavily washed with wood brown; fore and hind feet and toes entirely dusky brownish or slightly mixed with grayish. Worn pelage: Upperparts varying from brownish sepia to raw umber, darkest in middle of back.

Skull.—Essentially as in *P. t. paulus.*

Measurements.—Type: Total length, 110; tail vertebræ, 48; hind foot, 14; ear from notch (dry), 9.9. Average of eight topotypes: 112 (105–123); 45.7 (39–53); 14.4 (13.5–15); 9.9 (9.6–10.3).

Remarks.—This form is very similar in color to *subater* and *nigrescens.* All three have doubtless developed dark hues from approximately the same cause, since all inhabit more humid regions than their paler relatives. *P. t. analogus* averages slightly larger than *paulus* and *taylori*, but the difference is not of great importance, as size is quite variable throughout the group. Specimens from Patzcuaro and Acambaro, Michoacan, and also from Mascota and Tepic apparently tend toward *paulus.* The dusky feet of this form are found in the majority, but not in all specimens.

Specimens examined.—Total number 83, from localities, as follows:

Jalisco: Ameca, 10; Mascota, 6; Ocotlan, 8.
Mexico: Tlalpam, 25.
Michoacan: Acambaro, 3; Los Reyes, 8; Patzcuaro, 4; Zamora, 10.
Tepic: Tepic, 9.

Key to subspecies of Peromyscus musculus.

Color paler, general effect broccoli brown or wood brown. Western and southern Mexico, *P. musculus*
Color darker, chiefly rich dark brown or sooty.
  Color more brownish. State of Veracruz........................*P. m. brunneus*
  Color more blackish. Chiapas and Guatemala....................*P. m. nigrescens*

PEROMYSCUS MUSCULUS (MERRIAM).

(Pl. IV, fig. 11; pl. V, fig. 10; pl. VI, fig. 10; pl. VII, fig. 11.)

Sitomys musculus Merriam, Proc. Biol. Soc. Wash., VII, pp. 170–171, Sept. 29, 1892.

Peromyscus musculus Allen and Chapman, Bull. Am. Mus. Nat. Hist., N. Y., IX, p. 203, June 16, 1897.

Baiomys musculus Mearns, Bull. No. 56, U. S. Nat. Mus., p. 381, Apr. 13, 1907.

Type locality.—Colima, Colima, Mexico.

Geographic distribution.—Arid tropical parts of central and southern Mexico from the Isthmus of Tehuantepec north to central Veracruz and northwest to Colima and possibly to central Sinaloa.

Characters.—Similar in color and general characters to *P. taylori paulus*, but decidedly larger (hind foot 15–17); skull larger and heavier.

Color.—Practically as in *P. t. paulus*, averaging slightly less fawn. Unworn pelage: Ground color of upperparts clay color heavily mixed with dusky, producing a general effect varying from dark broccoli brown to isabella color, scarcely or not at all darker in middle of back; underparts dull cream buff, sometimes becoming grayish white on throat; feet white or grayish white, tarsal joint slightly dusky; tail indistinctly bicolor, brownish above, grayish white below. Worn pelage: Upperparts nearly uniform cinnamon, lightly sprinkled with dusky or sometimes paler, almost clay color.

Skull.—Decidedly larger than in *P. taylori* and subspecies; braincase actually and relatively broader; nasals usually not exceeded by ascending branches of premaxillæ; molars larger and heavier.

Measurements.—Average of 10 adult topotypes: Total length, 124.7 (116–135); tail vertebræ, 50.8 (42–56); hind foot, 16.5 (16–17); ear from notch (dry), 11.2 (10.5–12).

Type specimen.—No. $\frac{33437}{45460}$ U. S. National Museum, Biological Survey Collection. ♂ adult. March 9, 1892. E. W. Nelson. Specimen in good condition.

Remarks.—The distinction between this species and *P. taylori* is chiefly one of size. Representatives of the two species are found together at least at one locality, Colima, and there they are distinct with no suggestion of interbreeding. At other localities, so far as known, only one species occurs, though each species varies in size so it is sometimes difficult to decide whether one is dealing with small examples of *musculus* or with large ones of the *taylori* series. The subspecies of *musculus*, like those of *taylori*, are chiefly characterized by color alone, apparently controlled by the relative humidity of their respective habitats. Specimens from Culiacan, Sinaloa, and Valparaiso, Zacatecas, are tentatively referred to *musculus*, though their skulls are somewhat peculiar.

Specimens examined.—Total number 204, from localities as follows:

Colima: Armeria, 8; Colima, 10.
Guerrero: Acapulco, 3; Ayusinapa, 1; Chilpancingo, 14; El Limon, 3; near Ometepec, 7; Rio Balsas, 1; Tlalixtaquilla, 3; Tlapa, 1.
Jalisco: Plantinar, 1; Zapotlan, 3.
Michoacan: La Huacana, 1; La Salada, 11.
Morelos: Cuernavaca, 9; Puente de Ixtla, 2; Yautepec, 12.
Oaxaca: Chicapa, 2; Huilotepec, 12; Juquila, 8; Llano Grande, 3; Oaxaca, 15; Pinotepa, 2; Reforma, 8; San Bartolo, 1; Tehuantepec, 26; near Totolapa, 1; Yaganiza, 1; Yalalag, 1.
Puebla: Acatlan, 1; Piaxtla, 4.
Sinaloa: Culiacan, 2.
Veracruz: Carrizal, 4; Chichicaxtle, 4; Santa Maria, 9.
Zacatecas: Valparaiso, 10.

PEROMYSCUS MUSCULUS BRUNNEUS Allen and Chapman.

Peromyscus musculus brunneus Allen and Chapman, Bull. Am. Mus. Nat. Hist., N. Y., IX, pp. 203–204, June 16, 1897.

Type locality.—Jalapa, Veracruz, Mexico.

Geographic distribution.—East central Mexico, in slightly more humid parts than those inhabited by *P. musculus*.

Characters.—Similar to *P. musculus*, but darker and more richly colored; very slightly smaller.

Color.—Similar in general to that of *P. musculus*, but darker and more brownish; general effect of upperparts varying from reddish sepia to raw umber and Prout brown; underparts dull clay color slightly mixed with grayish and slaty; feet whitish gray; tail very indistinctly bicolor, brownish above, soiled whitish gray below.

Skull.—Similar to that of *P. musculus*, but averaging slightly smaller; nasals somewhat shorter.

Measurements.—Average of 20 topotypes: Total length, 118 (110–130); tail vertebræ, 46.8 (40–51); hind foot, 15.3 (14.5–16.5); ear from notch (dry), 10.7 (10.4–11.2).

Type specimen.—No. $\frac{12536}{10846}$ American Museum of Natural History, New York. ♀ adult. April 13, 1897. F. M. Chapman. Skin in good condition; skull with small puncture in supraoccipital and unimportant breaks in zygoma and basioccipital.

Remarks.—This form is characterized chiefly by its rich brownish color. It inhabits slightly more humid places than typical *musculus*. which lives near it in comparatively arid conditions. Doubtless its range will prove to be rather more extensive than at present known. It is somewhat intermediate between *musculus* and *nigrescens*, but appears never to be as sooty as *nigrescans* and also differs slightly in cranial characters.

Specimens examined.—Total number 42, from localities as follows:

Veracruz: Jalapa, 39; Texolo, 3.

PEROMYSCUS MUSCULUS NIGRESCENS Osgood.

Peromyscus musculus nigrescens Osgood, Proc. Biol. Soc. Wash., XVII, p. 76, March 21, 1904.

Type locality.—Valley of Comitan, Chiapas, Mexico.

Geographic distribution.—Southern Mexico (State of Chiapas) and northern Guatemala.

Characters.—Similar to *P. musculus* and *P. m. brunneus*, but darker and more sooty; skull slightly characterized.

Color.—Upperparts mixed Vandyke brown and sooty, the sooty slightly concentrated in middle of back; underparts cream buff, to roots of hairs in middle of belly, on tips only at sides; feet usually dull whitish gray, sometimes slightly brownish dusky; tail indistinctly bicolor, dusky above, grayish white mixed with brownish below.

Skull.—Slightly smaller and more elongated than in *P. musculus* and *P. m. brunneus;* braincase narrower; interorbital space narrower.

Measurements.—Average of ten adult topotypes: Total length, 115.5 (113–120); tail vertebræ, 43 (40–45); hind foot, 15 (14.5–16); ear from notch (dry), 11 (9.8–12).

Type specimen.—No. 76827 U. S. National Museum, Biological Survey Collection. ♀ adult. Dec. 9, 1895. E. W. Nelson and E. A. Goldman. Specimen in good condition.

Remarks.—In the *musculus* series this form is analogous to the dark forms of the *taylori* series. It differs slightly in cranial characters from *P. m. brunneus*, but is only a few degrees darker in color. Its range is apparently cut off from that of *brunneus* by the arid Isthmus of Tehuantepec, inhabited by typical *musculus.*

Specimens examined.—Total number 53, from localities as follows:

Chiapas: Ocozucuautla, 2; Ocuilapa, 4; San Bartolome, 2; San Vicente, 1; Tonala, 8; Tuxtla Gutierrez, 4; Valley of Comitan, 22; Valley of Jiquipilas, 1.

Guatemala: Jacaltenango, 8; Nenton, 1.

Table of external measurements of Peromyscus.

External measurements—averages and extremes.

Species.	Total length.		Tail vertebræ.		Hind foot.		Ear, from notch (dry).		Number measured.
	Average.	Extremes.	Average.	Extremes.	Average.	Extremes.	Average.	Extremes.	
P. maniculatus	179	174–198	84	75–95	21	19–23	....	....	....
P. m. gracilis	190	176–206	96.8	85–108	21.4	20.8–21.8	17.4	16.7–18.3	10
P. m. abietorum	177	171–187	91.6	82–97	21	20–22	....	....	10
P. m. argentatus	180	171–194	87.8	82–93	21.2	20–22	....	....	23
P. m. eremus	183	172–189	83	78–90	21	....	15.7	15–16	10
P. m. nubiterrae	....	173–188	....	93–98	....	19.5–21	15.8	15.2–16	2
P. m. arcticus	160	150–172	71	62–78	20	19–21	15.8	15–16.8	25
P. m. oreas	201	185–214	111	105–123	22.8	22–24	16.6	15.9–17.1	12
P. m. hylaeus	198.4	191–205	98	91–105	23	22–23.5	15.3	14.5–16.8	20
P. m. algidus	192	178–204	94	83–101	22.5	22–23.5	15.8	15–16.4	20
P. m. keeni	197	....	102	....	22.7	....	14.7	14–15.2	20
P. m. macrorhinus	209	200–217	112	105–117	24.5	24–25	16.1	15–17	6
P. m. artemisiae	167	155–180	75	69–86	20.5	19–22	16.1	14.8–18	6
P. m. saturatus	180.9	....	76.2	....	21.25	....	....	....	10
P. m. hollisteri	180.8	167–188	79.3	73–84	22.1	21–22.5	16.8	15.2–17.2	10
P. m. austerus	172	163–190	86	79–96	20.5	20–21	15	14–15.5	10
P. m. rubidus	193	189–203	96	90–100	21.5	21–22	15.8	15.2–16.9	6
P. m. gambeli	161	157–173	72.4	70–77	20	....	14.9	14.2–15.8	10
P. m. rufinus	160	150–170	70	56–75	20	19–21	15.5	14.1–16.6	15
P. m. nebrascensis	158	147–170	63.7	56–71	20.1	20–21	14.8	14–15.7	10
P. m. luteus	149	142–158	61.5	56–65	19.5	19–20.5	12.5	....	10
P. m. bairdi	....	161–140	....	70–54	....	19–18	12.6	11.5–14	2
P. m. pallescens	126	121–130	51	50–52	16	15–17	11.7	11.2–12.7	9
P. m. blandus	161	145–173	68	59–75	21.4	21–22	14.9	13.8–15.3	7
P. m. fulvus	162	150–183	71.5	65–78	22	....	15.5	14.2–16.9	10
P. m. labecula	173	168–182	72	64–82	22.5	22–24	14.9	14.5–15.5	10
P. m. sonoriensis	166	152–176	75	65–80	20.7	20–21.5	16.4	15.2–17.7	10
P. m. coolidgei	171	162–178	82	79–86	21	....	16.3	15.4–18	7
P. m. margaritae	163	157–168	77	74–81	21.3	20–22	16.5	14.6–17.5	10
P. m. clementis	164	156–172	74	68–78	20.6	20–21.5	15.3	14–17	10
P. m. catalinae	196	185–214	96	88–105	22	21–23	15.7	15–16.8	10
P. m. dubius	186	176–195	84	77–92	21	20–22	15.5	14.6–17.4	5

External measurements—averages and extremes—Continued.

Species.	Total length.		Tail vertebrae.		Hind foot.		Ear, from notch (dry).		Number measured.
	Average.	Extremes.	Average.	Extremes.	Average.	Extremes.	Average.	Extremes.	
P. m. geronimensis	178	170–182	81	79– 85	22.4	21 –23	16	14.5–17.3	10
P. m. cineritius	175	171–184	76	75– 78	21.8	....	....	....	3
P. m. magdalenae	184	175–200	88	82– 96	22.8	22 –23	16.6	15.5–17.8	7
P. sitkensis	224	....	113.6	....	26.5	....	16.5	14.9–17.8	10
P. s. prevostensis	216	205–230	105	97–116	26.2	25 –28	15.6	14.4–16.4	45
P. polionotus	130	125–137	47	41– 52	16.6	15.6–17.7	13	12 –13.4	5
P. p. niveiventris	139	128–153	52	50– 60	18.1	17 –19	12.4	11.6–13.5	10
P. p. phasma	138.5	....	53	....	18.7	....	14	....	10
P. p. rhoadsi	126	....	47	....	17	....	....	....	10
P. melanotis	155	132–168	64	58– 66	20.7	20 –21.5	18	17 –19.2	6
P. leucopus	166.5	158–177	77	73– 80	20.5	20 –21	13.7	13.4–14	6
P. l. noveboracensis	173.4	163–188	77.5	73– 83	21.4	21 –22	14.3	13.6–14.7	10
P. l. ammodytes	173	161–190	79	71– 88	20	19.5–21	....	....	10
P. l. fusus	194.4	190–203	90.7	85– 96	22.4	21.5–23.5	....	....	6
P. l. aridulus	169	160–177	69	63– 73	22	21 –23	14.1	13.6–15.5	4
P. l. ochraceus	....	173–180	....	82– 82	....	22.5–22.5	....	....	2
P. l. tornillo	182	171–202	82.6	75– 97	22.5	21–24	14.5	13.9–15.3	10
P. l. arizonae	186	178–193	82.6	78– 85	22.6	22–24	....	....	5
P. l. texanus	178	160–195	77	68– 91	21.5	20.5–22.8	14.8	14.1–15.6	10
P. l. mesomelas	169	....	76	....	23	....	13.5	....	1
P. l. castaneus	163	156–169	73	68– 79	21.5	20 –22	12.5	11.3–13.6	10
P. l. affinis	....	180–182	....	81– 84	....	22 –24	14.3	13.5–15	2
P. l. cozumelae	184	163–198	83.8	76– 90	23.3	22 –24	14.6	13.7–15.7	10
P. gossypinus	....	160–171	....	72– 71	....	24 –23	15.7	15 –16.8	2
P. g. megacephalus	196	188–205	84	78– 90	24	23 –26	15.5	15 –16.3	6
P. g. palmarius	178.8	172–183	74.5	69– 78	21.1	20 –22	14.7	14 –15	7
P. g. anastasae	167.5	....	69.5	....	21.4	....	....	....	6
P. boylei	197	183–202	103	92–112	22	21 –23	16.4	15.3–17.5	10
P. b. rowleyi	191	180–207	99	91–109	21.6	21 –23	17.2	16.6–18	10
P. b. attwateri	205	196–218	103	97–112	24.3	23 –25	16.2	15.5–17.2	10
P. b. spicilegus	198	189–210	101	95–108	23.4	23 –25	16.3	15.4–17.3	8
P. b. simulus	208	....	111	....	23	....	15	....	3
P. b. madrensis	224	....	120	....	26	....	15.6	14.7–17.2	12
P. b. evides	222	212–230	112	105–122	23.6	23 –25	13.6	12.6–14.5	10
P. b. levipes	208	198–234	108	97–123	24	23 –25	16.2	15.6–16.7	10
P. b. aztecus	229	215–238	113	107–121	24.5	24 –26	15.2	14.5–16	5
P. oaxacensis	246	241–260	127	120–135	27	....	16.7	15.8–17.5	6
P. hylocetes	227	220–237	113	106–117	26.1	25 –27	18	17.5–18.5	6
P. pectoralis	201	195–209	110.7	102–115	21	20 –22	15.5	15.4–17.2	10
P. p. eremicoides	....	180–195	....	102–111	....	20 –21	15.3	14.3–16.6	2
P. p. laceianus	187	185–192	96	94–100	22.1	22 –23	15.8	15 –16.2	6
P. truei	186	180–195	92	86–102	23.5	....	22.4	21.5–24	10
P. t. gilberti	200	186–206	98	87–103	22.5	22 –24	19.2	18 –21	5
P. t. martirensis	213	205–222	116.5	112–122	24	....	21.7	21 –23	6
P. t. lagunae	193	182–210	105	97–118	22.4	21.5–23	19	18 –19.8	10
P. t. gratus	204	191–225	110.5	103–125	22.8	22 –24	19	17.5–20.2	10
P. t. gentilis	201	194–210	111.7	103–120	23.8	23 –24.5	18.6	18 –19.3	10
P. nasutus	195	180–210	99	91–105	23.2	22 –24	19.7	18.5–20.5	5
P. polius	218.5	210–234	117	111–120	25.8	25 –26	18.1	17.2–18.5	8
P. difficilis	233	212–255	127	115–143	26.3	25.5–28	21.6	19.7–23	10
P. d. amplus	248	235–260	136	128–145	27	26 –28	20.9	19.5–21.8	10
P. d. felipensis	241.5	225–248	127	118–132	26.8	25.5–27.5	20.4	19 –21.7	10
P. bullatus	200	....	93	....	23	....	25	....	1
P. melanophrys	269	262–275	149	146–155	28	....	19.3	18.5–21	3
P. m. zamorae	259	249–280	144	137–152	28.4	27 –30	20	19 –21	7
P. m. consobrinus	256	250–260	135	131–139	27.5	26.5–28	19	18 –19.8	5
P. xenurus	....	246–248	....	142–140	....	28 –28	21.5	....	2
P. mekisturus	249	....	155	....	24	....	18.4	....	1
P. lepturus	228	218–238	115	112–119	27	26 –28	17.3	16.4–18.2	7
P. lophurus	208	....	105	....	24.5	....	16	....	4
P. simulatus	169	....	87	....	21	....	14.3	....	1
P. guatemalensis	267	252–290	138	132–153	30.7	30 –32	20.6	20 –21.5	10
P. furvus	263	248–282	131	123–145	27.9	26 –29	21.9	20 –23	14
P. nudipes	261	250–280	130	121–135	28.6	26 –30	19.1	18.4–19.4	6
P. mexicanus	246	235–254	128	118–133	26.6	26 –27	19	17.7–20.5	4
P. m. totontepecus	257	244–268	131	124–136	28.2	28 –29	16.9	16 –17.8	5
P. m. saxatilis	244	233–258	127	120–138	27.6	27 –29	18.2	16.6–19.5	10
P. m. teapensis	245	234–254	129	121–136	28	27 –28.5	17.7	17 –18.6	10
P. m. gymnotis	....	191–220	....	92–104	....	23 –24	16	15 –17	2
P. allophylus	202	....	95	....	25	....	17	....	1
P. banderanus	234	228–245	119	115–127	25	....	18	17.2–18.5	5
P. b. vicinior	233	225–240	117	115–121	24.5	24 –25	16.2	16 –16.5	3
P. b. angelensis	235	222–258	120	112–128	27	26.5–28	17.3	17 –17.7	7
P. yucatanicus	216	208–232	112	105–122	23.8	23 –26	17	15.2–18.3	10
P. y. badius	193.4	....	96.7	....	23.5	....	16.4	16 –16.8	10
P. altilaneus	228	....	115	....	28	....	20.6	....	1
P. megalops	282	....	150	....	31	....	19	....	1

External measurements—averages and extremes—Continued.

Species.	Total length.		Tail vertebrae.		Hind foot.		Ear, from notch (dry).		Number measured.
	Average.	Extremes.	Average.	Extremes.	Average.	Extremes.	Average.	Extremes.	
P. m. auritus	288	....	148	....	30.5	....	23.3	....	1
P. m. melanurus	259	238–278	135	127–145	27.3	26–28.5	17	15.8–17.8	10
P. melanocarpus	262	....	132	....	30	....	19	....	1
P. zarhynchus	316	305–327	170.7	162–178	35.7	33.5–38	22.2	21.2–24	10
P. thomasi	330	310–350	175	162–188	32.8	32–34	23	21.4–24.8	7
P. nelsoni	....	302–318	....	172–170	....	35–32	20	....	2
P. flavidus	341.6	320–375	181.2	155–205	31.8	31–33	22.5	20–24	10
P. nuttalli	181	170–190	85	80–93	19.7	19–20	15.5	14.4–16.4	10
P. n. aureolus	172.5	164–184	83	80–88	18.8	17–20	14.1	13.4–14.6	7
P. floridanus	199.8	190–221	86.2	80–95	26.6	26–27.5	22.5	22–25	10
P. californicus	243	238–260	133	127–146	27	26–29	22.3	21.3–23.5	10
P. c. insignis	233	220–245	134	124–140	25	....	20.3	20–20.7	6
P. eremicus	183	172–192	101	94–108	20.5	20–21	17.5	17.3–17.8	10
P. e. fraterculus	191	....	112	....	20	....	16.4	15.5–17	3
P. e. cedrosensis	193	181–200	110	106–114	20	....	16	15.5–16.5	8
P. e. eva	198	185–218	114	100–128	20.4	20–21	16.6	15.6–17.2	10
P. e. insulicola	....	196–200	....	115–113	....	20–19.5	....	16.5–16.7	2
P. e. avius	194	186–209	105	100–116	21.6	21.5–22	14.5	13.4–16	10
P. e. polypolius	192	183–200	109.5	100–117	19.5	19–20	15.7	14.6–16.8	10
P. e. anthonyi	194	188–202	108	102–113	21.5	21–22	16	....	10
P. e. tiburonensis	170	....	92	....	18	....	15	....	1
P. e. phaeurus	189	176–195	98	92–103	21	....	16	15.2–16.8	9
P. goldmani	217	....	117	....	24	....	18.2	....	1
P. crinitus	176	172–184	95	92–97	21	....	16.3	15.4–17.5	9
P. c. auripectus	177.7	174–182	93	89–98	20.8	20–21	17.3	16.6–18	10
P c. stephensi	170	161–176	94	88–101	20	....	16	15.3–16.5	10
P. taylori	97	87–110	38	34–45	14.3	14.5–15	9	8.8–10	7
P. t. subater	99	88–104	39	36–44	14.5	14–15	9	8–9.4	7
P. t. paulus	....	108–110	....	43–49	....	14–15	....	9.6–9.8	2
P. t. analogus	112	105–123	45.7	39–53	14.4	13.5–15	9.9	9.6–10.3	8
P. musculus	124.7	116–135	50.8	42–56	16.5	16–17	11.2	10.5–12	10
P. m. brunneus	118	110–130	46.8	40–51	15.3	14.5–16.5	10.7	10.4–11.2	20
P. m. nigrescens	115.5	113–120	43	40–45	15	14.5–16	11	9.8–12	10

Cranial measurements of Peromyscus.

Species.	Locality.	Greatest length.	Basilar length.	Zygomatic breadth.	Interorbital constriction.	Interparietal.	Nasals.	Shelf of bony palate.	Palatine slits.	Diastema.	Postpalatal length.	Maxillary tooth-row.
P. maniculatus	Nain, Labrador	26.5	20.4	13.8	3.9	9.5 x 2.5	11	4.2	5.5	7.5	......	3.9
P. m. gracilis	Tower, Minnesota ♂	26	19.6	13.1	4	9 x 2.6	10.2	4	5	7	9.2	3.4
Do	do ♀	25.8	20.1	12.3	3.7	8.7 x 3.3	10.4	4.1	5.4	7	9.2	3.5
P. m. abietorum[a]	James River, Nova Scotia	25.4	19.3	12.6	3.7	9.1 x 2.3	10.5	4.1	5	6.9	8.8	3.3
P. m. argentatus[a]	Grand Manan, New Brunswick	26.4	20	13.7	4	....	10.3	4	....	....	....	3
P. m. eremus[a]	Magdalen Islands, Quebec	26.2	20.6	13	3.8	8.3 x 2.8	10.7	4	4.9	7.4	9.3	3.7
P. m. nubiterrae[a]	Roan Mountain, North Carolina	24.3	19	13	3.5	....	9.3	4.5	4.8	6.2	9	3.8
Do	do	25.4	19.2	12.6	3.8	8 x 2.3	10	3.9	5	6.8	8.5	3.6
Do	do	23.6	17.9	12.2	3.7	8.4 x 2.3	9	3.8	4.5	6.2	8.2	3.5
P. m. arcticus[a]	Fort Simpson, Canada	25.4	....	13	3.9	8.9 x 2.8	10.1	4.1	5.1	6.7	....	3.6
Do	do	26.5	20.2	13.8	4.2	9.3 x 2.7	10.7	4.4	5.1	7	8.9	3.7
Do	do	25.3	19.3	13.2	3.9	8.8 x 2	10.5	3.8	4.9	6.5	9	3.6
P. m. oreas[a]	Mount Baker Range, British Columbia	27	20.8	13.2	3.8	9 x 3	11.7	4.6	5.1	7.7	9.3	3.7
Do	Mount Rainier, Washington	27.4	20.6	13.9	4.1	10 x 3.2	10.6	3.8	5.7	7.3	9.5	3.7
Do	do	26.9	21	12.8	3.8	8.9 x 2.5	10.6	4	5.8	7.4	9.5	3.8
P. m. hylaeus[a]	Prince of Wales Island, Alaska	26.9	21	13.2	3.8	9.6 x 3.2	10.5	4	5.9	7.5	9.1	3.7
Do	do	27	21	14	3.9	9.4 x 3	10.9	4.2	6	7.4	8.8	3.9
P. m. algidus[a]	Bennett, British Columbia	27.1	21	13.4	4.2	10 x 3	10.4	4	5.6	7.3	9.6	3.6
P. m. keeni	Skidegate, British Columbia	27	20.7	13.8	4.2	10 x 3	9.9	4	5.7	7.5	9	3.8
Do	do	27	21.3	14.3	4.1	9.5 x 2.8	10.1	4.2	6	8	9.1	3.9
P. m. macrorhinus[a]	Skeena River, British Columbia	28.8	22.5	14	4.1	9.5 x 2.8	11.5	4.1	6.6	8.2	9.9	4.2
Do	do	29	22.3	15.2	3.9	10 x 2.6	11.4	4.3	6.5	8.5	9.5	4.2
Do	do	28	21.9	14.5	4.1	8.7 x 2.8	11.4	3.8	6.6	8	9.6	4
P. sitkensis	Sitka, Alaska	30.7	24	15.4	4.2	10.3 x 3.1	13.1	4.6	6.8	8.6	10.5	4.3
Do	do	29.5	23	15	4.3	10 x 2.9	12.7	4.5	6.6	8.5	10	4.4
P. s. prevostensis	Prevost Island, British Columbia	30.4	23.7	16.1	4.4	10 x 3.5	11.9	5	6.1	8.9	10.1	4.6
Do	do	29.8	23	14.9	4.3	9.6 x 3	11.3	4.5	6.3	8.2	9.5	4.4
P. m. artemisiae[a]	Ashcroft, British Columbia	26	20.3	13	......	....	11.8	4.5	6	7.6	9.9	4
Do	do	26.5	20.7	13.2	......	....	11.2	3.9	5.9	7.2	9.6	3.8
P. m. saturatus[a]	Saturna Island, British Columbia	26.3	20.6	14	4.3	9 x 2.4	10.5	3.7	5.5	7.1	9.5	3.9
P. m. hollisteri[a]	San Juan Island, Washington	27.1	21.1	14.5	4	8.3 x 2.4	10.8	3.9	5.5	7.5	9.7	3.8
P. m. austerus	Steilacoom, Wash	25.6	19.2	12.5	3.8	8.4 x 2.8	8.8	3.6	5	6.4	9	3.4
Do	do	24	18	11.1	3.3	9 x 2.5	9.7	3.1	5	6	8.4	3.2
P. m. rubidus[a]	Mendocino, California	26	19.7	13.3	4	9.3 x 2.2	9.5	4	5.2	6.6	8.7	3.8
P. m. gambeli	Monterey, California	25	19	13	3.7	8.5 x 2.3	9.8	3.5	5.2	6.3	8.8	3.6
P. m. rufinus	San Francisco Mountain, Arizona	26.6	20.5	13.9	3.9	....	10.3	4	5.4	6.7	9.8	3.8
Do	do	25.5	19.9	13	4	....	10.5	4	5.4	6.4	8.9	3.6
Do	do	24.8	19	12.4	3.8	....	9.9	4	4.6	6.4	8.6	3.4
P. m. nebrascensis	Calf Creek, Montana	26.5	19.9	14	4	....	10.3	4	5.2	6.8	9	3.9

[a] Type.

Cranial measurements of Peromyscus—Continued.

Species.	Locality.	Greatest length.	Basilar length.	Zygomatic breadth.	Interorbital constriction.	Interparietal.	Nasals.	Shelf of bony palate.	Palatine slits.	Diastema.	Postpalatal length.	Maxillary toothrow.
P. m. nebrascensis	Calf Creek, Montana	25.4	19	13.4	4	....	10	3.9	5	6.7	8.1	3.6
Do.	...do	25.2	19.3	13.3	4	....	9.8	3.5	5.1	6.7	8.9	3.7
P. m. luteus[a]	Kennedy, Nebr	24.8	19	13	4.1	8 x 2	10.4	3.6	5.4	6.7	8.7	3.4
Do.	...do	23.7	18.2	13	3.6	8.3 x 2	9.1	3.6	4.9	6.3	8.2	3.6
P. m. bairdi	Racine, Wis	23.7	19	12.4	4	8 x 1.6	9.5	3.6	4.9	6.6	8.7	3.2
Do.	...do	22.9	17.8	11.7	3.6	8 x 2.4	8.9	3.3	5	6.2	8.2	3.2
P. m. pallescens[a]	San Antonio, Tex	22.4	15.6	11.6	3.6	7 x 2	7.8	3.3	4	5.5	7.7	3.1
Do.	...do	23.5	18.5	12.8	3.7	8 x 2.1	9.2	3.7	4.8	6.1	8.7	3.2
P. polionotus[a]	Gainesville, Fla	22+	16.5+	11.8	3.7	8 x 2.7	8.8	3.6	4	5.4	7.3	3
Do.	...do	23.5	17.9	12.2	3.7	8 x 2.6	9	3.4	4.6	5.9	8.2	3.2
P. p. niveiventris[a]	Opposite Micco, Fla	24	18	12.6	3.8	8.7 x 2.4	9.1	3.9	4.7	6.1	8.2	3.3
Do.	...do	24	19.1	13	3.9	8.2 x 2.7	9	4	4.2	6	8	3.5
Do.	...do	22.8	17	12.2	3.9	8.5 x 2.4	8.3	3.9	4.1	5.7	7.6	3.3
P. p. phasma[a]	Anastasia Island, Florida	23.3	17.7	12	4.1	8.2 x 2.8	9.6	4.1	3.6	5.5	8.2	3.4
P. p. rhoadsi[a]	Anclote River, Florida	22.2	17	11.5	3.6	8 x 2	7.9	3.6	4.1	5.6	7.3	3.2
P. m. blandus[a]	Escalon, Chihuahua	25.4	19.7	12.5	4	8 x 1.9	9.8	3.5	5.7	6.7	9.1	3.8
P. m. fulvus[a]	Oaxaca, Oaxaca, Mexico	25	19.5	12.8	4	8 x 2.1	10	3.7	5.6	6.5	8.7	3.8
P. m. labecula[a]	Ocotlan, Jalisco	25.7	21	....	3.7	7.2 x 2.5	11	3.7	5.8	7.3	9.5	4.1
Do.	...do	27.4	21.5	14	3.8	8.4 x 2.7	10.6	4.1	5.9	7.4	9.8	4.4
P. m. sonoriensis	Santa Cruz River, Sonora	27.3	20.3	13.4	3.8	9.4 x 2.8	10.8	4.3	5	6.8	9.1	3.9
Do.	...do	25.9	20.1	13.4	3.5	8.2 x 2.3	10.7	4.2	5.7	6.9	8.9	3.8
P. m. coolidgei	San Jose del Cabo, Lower California	25.4	20	13.4	3.8	8.4 x 2.3	9.4	3.7	5.4	6.9	9.2	3.9
Do.	...do	25.7	20	13.1	3.7	8.6 x 2.7	10	4	5.2	6.9	8.9	3.8
P. m. margaritae[a]	Margarita Island, Lower California	25.7	19.4	13.2	3.7	9 x 3	9.6	3.6	5.2	6.3	9.2	3.6
P. m. clementis	San Clemente Island, California	25.8	20	13.1	3.9	8.7 x 2.5	9.4	4.1	5.2	6.4	9.2	3.9
Do.	...do	27.3	20.5	13.8	4	8.7 x 2.2	10.7	3.8	6	7.2	8.9	3.8
P. m. catalinae[a]	Santa Catalina Island, California	....	19.8	13.3	3.9	8.7 x 2.3	9.9	3.9	5.2	6.4	9.2	3.8
Do.	Santa Cruz Island, California	28.3	21.4	13.8	3.8	8.6 x 2.7	11	3.8	5.8	7.3	10	3.9
P. m. dubius[a]	Todos Santos Island, Lower California	26.4	20.2	14	4.1	8.5 x 3.3	9.4	3.9	5.3	6.8	9	3.8
Do.	...do	27.3	21	13.8	4.1	8.7 x 2.3	10.9	3.9	5.5	7	9.7	4
P. m. geronimensis	San Geronimo Island, Lower California	26.8	20.7	13.7	3.9	8.9 x 2.1	11	3.7	5.5	7.2	9.6	3.6
Do.	...do	26	20.4	13.9	4	9 x 2.8	10.7	3.9	5.5	6.8	9.1	4
P. m. cineritius[a]	San Roque Island, Lower California	27	22	14.1	3.9	8.3 x 2.2	9.6	4.2	5.8	7.2	9.9	....
P. m. magdalenae	Magdalena Island, Lower California	27	20.8	14	4.3	9.5 x 3	10	3.4	6	7	9.8	4
P. melanotis[a]	Las Vigas, Veracruz	27	....	13.6	3.9	9.4 x 2.8	11	4	5.5	....	....	3.8
Do.	...do	25.6	....	12.7	3.7	7.2 x 2.5	11	4	5.4	7	....	3.9
P. leucopus	Houma, La	26	19.9	13.3	4	8.4 x 2.5	10	4	5	6.8	9	3.5
P. l. noveboracensis	Lake George, New York	26.3	19.5	13	4	8.3 x 2.5	10	4	5	6.7	9	3.5
P. l. ammodytes[a]	Monomoy Island, Massachusetts	25.2	20	13.2	4.2	....	10.4	3.9	5.2	7	8.9	3.8
P. *l.* fusus[a]	Marthas Vineyard, Mass	28	21.7	14.5	4.3	....	11	4.3	5.4	7.5	10	3.6
P. l. aridulus[a]	Fort Custer, Mont	26.8	20.7	14.3	4.3	8.9 x 3	10	4.3	5.5	7.3	9.3	4

P. l. ochraceus a	Winslow, Ariz	26.5	21	14.8	4	....	10.6	4.1	5	7.5	9.8	3.8
P. l. tornillo	Near El Paso, Tex	28.4	22.1	14.5	4.3	....	10.6	4.5	5.5	7.7	10	4
Do	do	26	19.7	14	4.2	....	9.5	3.8	4.5	6.3	9.4	4
P. l. arizonæ a	Fairbank, Ariz	26.8	20.9	13.5	4	....	10.3	4.7	4.9	6.7	9.6	3.9
P. l. texanus	Brownsville, Tex	26.6	20	13.6	4.2	....	9.5	4	4.7	6.7	9.1	3.8
Do	do	25.3	19	13	4.1	....	9	4	4.4	6.2	8.7	3.7
P. l. mesomelas a	Orizaba, Veracruz	26.5	20.2	13.6	4	8.6 x 2.3	10.4	3.8	5.2	6.9	9.1	3.7
P. l. castaneus a	Yohaltun, Yucatan	25.3	19	13	4	8 x 2.3	9.3	4	4.2	6.2	9.5	3.5
P. l. affinis a	Barrio, Oaxaca	26.9	21.5	13.5	4.2	....	11	4.2	4.7	7	10.3	3.5
P. l. cozumelae a	Cozumel Island, Yucatan	27.3	20.7	14.8	4.1	....	10.5	4.1	5	7	10	4.9
Do	do	27	21	14	4	....	10.5	4.4	4.5	7	9.9	3.8
P. gossypinus	Savannah, Ga	28.5	21.9	15.2	4.3	9 x 2.7	11.1	4	5.6	7.8	10.2	4
P. g. megacephalus a	Woodville, Ala	30	....	15.1	4.4	9.9 x 3.3	11.3	4	6	8	....	3.6
Do	Red Oak, Oklahoma	31.3	23.8	15.8	4.6	9.1 x 3	11.5	5	6	8.2	11.2	4
P. g. palmarius a	Opposite Micco, Fla	27.1	20.7	13.5	4.2	8 x 2.5	11	4	5.5	7	9.5	3.9
P. boylei a	American River, California	27.3	20	13.4	4.2	9.6 x 3	9.8	3.9	5.2	6.5	8.9	4.2
Do	do	27.1	20.3	13.9	4.4	9.3 x 3	10	3.9	5.3	6.8	9.3	4
P. b. rowleyi a	Noland Ranch, Utah	27.9	20.9	13.3	4.5	9.4 x 3	10.4	4.3	5.3	7	9.4	4
P. b. attwateri a	Kerr County, Tex	28.8	22.1	14.4	4.5	9.6 x 2.5	10.8	4	6	7.3	10.1	4
P. b. spicilegus a	San Sebastian, Jalisco	28.1	21.1	14	4.6	10 x 3.3	10.3	4.5	5.5	6.9	9.5	4.2
Do	do	29.1	22.3	14.6	4.3	9.5 x 2.8	11.4	4.4	5.8	7.6	10.5	4.5
P. b. simulus a	San Blas, Tepic	26.3	20.3	14	4.1	9 x 3.4	9.4	3.6	5.6	7	9.4	3.8
Do	do	27	20.3	14.6	4.2	9.2 x 3.3	9.6	4.2	5.2	6.6	9	4
P. b. madrensis a	Tres Marias Islands, Mexico	29.8	22	14.9	4.9	10 x 3	11	4.2	5.6	7	10	4.4
Do	do	30.1	22.9	15.5	4.5	10.4 x 3.2	11	4.3	5.9	7.5	10.4	4.5
P. b. evides a	Juquila, Oaxaca	29	22	14.4	4.6	9.3 x 3.2	11.5	4.7	5.6	7	9.1	5
Do	Los Reyes, Michoacan	30.5	23.8	15.3	4.6	9.5 x 3.6	12.3	4.5	6.4	7.6	10.9	4.8
P. b. levipes a	Mt. Malinche, Tlaxcala	28.9	22	15.6	4.5	9.2 x 2.8	11.4	4.4	5.6	7.4	9.9	4.6
Do	do	27.7	21.5	14.4	4.3	9.1 x 2.5	11	4.1	5.4	7	9.7	4.5
P. b. aztecus	Mirador, Veracruz	31.1	23.8	15.2	4.6	8.6 x 3.8	12.2	5.3	6.3	7.8	10.5	5
Do	do	29.5	22.9	16	5	10 x 4	11.5	5.2	5.8	7.2	10	5
P. oaxacensis	San Felipe, Oaxaca	33	25.2	16.5	4.9	10 x 4.3	13.1	5.3	6.3	8.5	11.2	5.1
Do	do	31.5	24.4	16	4.9	9.3 x 3.2	12.8	5.4	6.8	8.1	10.7	5.2
P. hylocetes	Mt. Tancitaro, Michoacan	32.4	24.8	15.8	5	10.5 x 4	12.8	4.8	6.7	8	11.3	5.1
Do	do	29.9	23.2	15.4	4.6	9.4 x 3.7	12	4.7	6.4	7.5	10.4	4.8
P. pectoralis a	Jalpan, Queretaro	27	19.7	13.7	4.2	....	9.9	3.7	4.9	6.3	9.4	3.8
P. p. eremicoides a	Mapimi, Durango	24	18	12	3.9	8.3 x 3	8.5	3.5	4.5	5.8	8.5	3.5
Do	Jaral, Coahuila	25.2	18.7	12.5	4	10 x 3.3	8.7	4	4.4	6	8.7	3.5
P. p. laceianus a	Kerr County, Tex	27.2	20	13.2	4.3	9.6 x 3.3	9.5	3.7	5.1	6.5	9.3	3.9
Do	do	27.9	20.6	13.8	4.5	9.8 x 3.5	10.9	4	5.4	7.4	9.4	3.8
P. crinitus a	Shoshone Falls, Idaho	24.3	18.3	12.5	4.1	9 x 2.9	8.9	4	4.6	6.1	8.2	3.4
P. c. auripectus a	Bluff City, Utah	25.4	18.3	13	4.4	9.5 x 2.1	10	3.5	5	6.2	8.2	3.4
P. c. stephensi a	Eastern base Coast Range, California	23.2	....	11	4	9 x 2.4	8.4	3.4	4.4	5.5	....	3.2
P. truei	Fort Wingate, N. Mex	29	21.6	14.4	4.6	10.5 x 3.2	11.4	4.2	5.5	7	10	4.3
Do	do	27.3	20.1	13.4	4	10.2 x 3	10	4.1	5	6.5	9.5	4
P. t. martirensis	La Grulla, Lower California	28.3	21.6	13.4	4.4	8.7 x 3	10.1	3.7	5.4	7	10.1	4
Do	do	27.8	21	13.8	4.5	8.5 x 3.6	10	4	5.4	6.5	9.6	4.1
P. t. lagunae a	Laguna Mountains, Lower California	27.7	20.6	13.3	4.1	10 x 4.	10.3	4	5.5	6.8	9.5	4
P. t. gratus a	Tlalpam, Mexico	27	20	13.8	4.4	10.1 x 3	9.8	3.7	5.5	6.5	9.4	4
Do	do	28.3	21.5	14.7	4.7	9.5 x 3.2	10.3	4.3	5.5	7	9.8	4.2

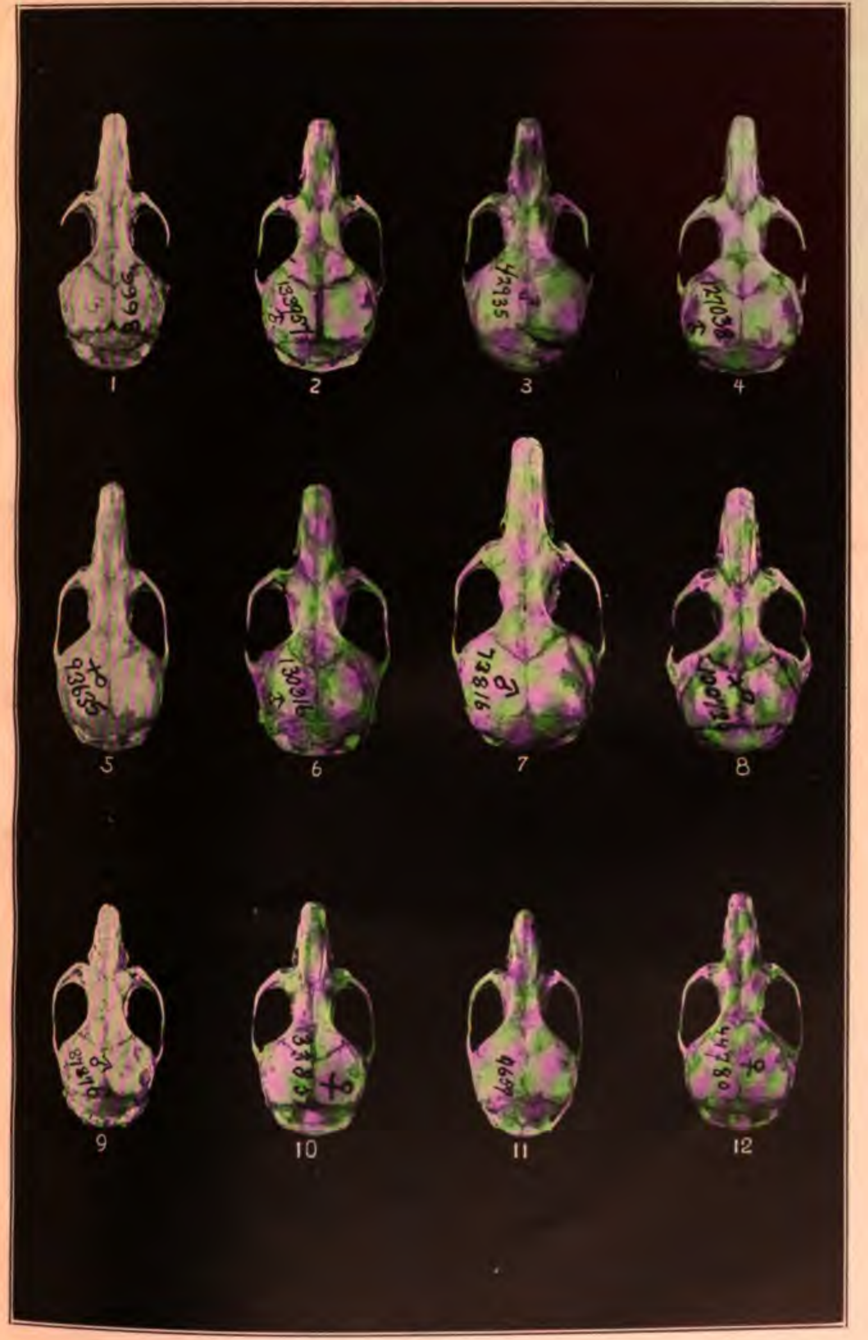
a Type.

Cranial measurements of Peromyscus—Continued.

Species.	Locality.	Greatest length.	Basilar length.	Zygomatic breadth.	Interorbital constriction.	Interparietal.	Nasals.	Shelf of bony palate.	Palatine slits.	Diastema.	Postpalatal length.	Maxillary toothrow.
P. nasutus	Gold Hill, Colo	29.4	21.9	14.5	4.4	10.3 x 3	11.2	4.2	5.5	7.4	10.1	4.3
Do	do	28.7	21.4	13.5	4.3	9.9 x 2.9	11.1	4.3	5.6	7.4	9.5	4.2
P. polius[a]	Colonia Garcia, Chihuahua	29.9	22.9	14.8	4.5	10.5 x 2.8	11.6	4.4	6	7.4	10	4.7
P. difficilis[a]	Valparaiso Mountains, Zacatecas	29.1	22.4	14.5	......	10 x 3	11	4.2	5.8	7.2	10.6	4.9
Do	do	30.2	23	15	4.5	10.4 x 3.7	11.2	4.5	6.2	7.5	11	4.8
P. d. amplus[a]	Coixtlahuaca, Oaxaca	30.4	23	15.4	4.5	10.4 x 3.7	11.3	4.6	6	7.9	10.2	4.8
Do	do	31.5	24.1	15.1	4.5	10 x 3.3	11.9	4.5	6.3	8.3	11	4.6
P. d. felipensis	Cerro San Felipe, Oaxaca	32.2	24.5	15.3	4.7	10.4 x 4	13.1	4.7	6.4	8.6	11	4.9
Do	do	31.1	24	15.5	4.7	10 x 3.8	12	4.3	6.3	8.2	11.3	4.8
P. bullatus[a]	Perote, Veracruz	28.9	22	14.5	4.5	10 x 3	10.4	4.2	5.8	8.3	10	4.3
P. melanophrys	Tonala, Chiapas	32.2	25	15.4	5	......	11.6	4.6	6.4	......	......	4.5
P. m. zamoræ	Zamora, Michoacan	31.3	25	16.5	......	......	12	......	6.6	......	......	4.7
P. m. consobrinus[a]	Berriozabal, Zacatecas	30.8	25.3	16.3	4.9	......	11.1	4.4	6.6	......	......	4.7
P. xenurus[a]	Durango, Durango	30	23.8	15.5	4.9	......	10.2	......	5.7	......	......	4.9
P. mekisturus[a]	Chalchicomula, Puebla	25.9	20.6	13.8	3.6	9 x 3	9.1	4	5	7.1	9.4	4
P. lepturus[a]	Mt. Zempoaltepec, Oaxaca	30.6	23.6	15.7	4.4	11 x 3.7	11.8	4.4	6.7	7.4	10.4	4.9
P. lophurus[a]	Todos Santos, Guatemala	27.5	20.8	14.7	4.3	10 x 4.5	10	4	5.4	6.5	9.6	4.7
P. simulatus[a]	Jico, Veracruz	24.4	18	12.5	4.3	8.2 x 3	9	3.5	4.6	6	8	3.9
P. guatemalensis[a]	Todos Santos, Guatemala	33.5	26.4	16.6	5	10.8 x 3.4	12.9	5.1	6.5	9	12.6	5.1
P. furvus[a]	Jalapa, Veracruz	35.1	27.3	17	5.3	12.3 x 4	14.2	6	6.6	9	12.3	5.3
P. nudipes	Volcan Irazu, Costa Rica	33	25.3	16	5.2	11.4 x 3.1	12.7	4.9	6.8	8.7	11.7	5.2
P. mexicanus	Mirador, Veracruz	31.7	24.3	15.6	4.8	10.8 x 4	12.2	4.6	5.8	8.4	11.4	4.5
Do	Papantla, Veracruz	33.2	25.3	16.3	4.8	11.5 x 3.1	13	4.8	6.5	8.5	12	4.5
P. m. totontepecus	Totontepec, Oaxaca	33	25.3	16.4	5.3	10.7 x 3.9	12.7	4.9	6	8.9	11.7	4.8
Do	Orizaba, Veracruz	34	26	16.5	5.3	11 x 4	13.5	4.8	6.3	8.8	11.9	4.9
P. m. saxatilis[a]	Jacaltenango, Guatemala	31.8	24	14.9	5	11.1 x 3.8	12.2	4.2	6.1	8	11.5	4.4
Do	do	33.3	25	15.4	4.9	10.8 x 3.9	13.8	5	6.3	8.3	11.4	4.7
P. m. teapensis[a]	Teapa, Tabasco	33	24.6	16.2	5.4	......	12.7	4.7	6	8.2	11.9	4.5
P. m. gymnotis[a]	Guatemala	30.5	23.1	15.4	4.6	......	12	......	5.8	8.2	......	4.1
Do	Huehuetan, Chiapas	31.4	24	15.2	5	......	12.4	4.4	6.2	8.6	10.9	4.3
P. allophylus[a]	do	29.8	22.5	14.5	5	......	11	4	6	8.2	10.5	4
P. banderanus[a]	Valle de Banderas, Tepic	30.6	23.9	15	5	11 x 4.4	12	......	5.2	......	......	4.2
Do	Hda. Magdalena, Colima	31	23.2	15.6	4.7	10.3 x 4	11.3	......	5	......	......	4.3
P. b. angelensis[a]	Puerto Angel, Oaxaca	31.3	23.4	15	5.2	10.6 x 3.6	11.7	4.8	6	8	10.8	4.6
P. yucatanicus[a]	Chichenitza, Yucatan	30.9	23.5	14.5	4.8	10.5 x 3.3	11.7	4.8	5.5	8.5	10.4	4
P. y. badius[a]	Apazote, Campeche	28.2	20.7	14.1	4.7	9.2 x 3.1	10.4	4.2	5.3	7	9.9	4.1
P. altilaneus[a]	Todos Santos, Guatemala	31	24	14.6	5	......	11.5	4.8	6	8.2	11.2	4.6
P. megalops[a]	Near Ozolotepec, Oaxaca	34.1	26.2	17	5.4	10.7 x 3.8	13	5	7	9.1	12	5.3
Do	do	33.5	26	17	5.9	10.6 x 4	12.9	5	7	9.3	12	5
P. m. auritus[a]	Near Oaxaca, Oaxaca	34.8	27	16.8	5.5	10 x 3.4	14.3	5.4	6.9	9.6	12	5
P. m. melanurus[a]	Pluma, Oaxaca	33.1	25	16.2	5.3	9.8 x 3.7	12.4	4.8	7	8.6	11.3	5.4

P. melanocarpus [a]	Mt. Zempoaltepec, Oaxaca	31.0	24.3	15.2	5.4	....	12	4.4	7.3	8.3	11	5
P. zarhynchus [a]	Tumbala, Chiapas	38.7	29.5	17.9	5.5	12 x 3.2	16	5.3	8.7	10.8	13.1	5.4
SUBGENUS MEGADONTOMYS.												
P. thomasi [a]	Near Chilpancingo, Guerrero	38	29.9	18.7	5.4	12 x 5	14.9	6.1	8.1	10.2	13.4	6
P. nelsoni [a]	Jico, Veracruz	36.8	28.6	18.3	5.2	10.7 x 4.3	14.3	6	7.8	9.7	12.8	6.3
P. flavidus [a]	Boquete, Panama	40.6	31.2	19.4	6.2	12.6 x 5	17.4	6.7	7.3	10.9	14.3	5.9
SUBGENUS OCHROTOMYS.												
P. nuttalli	Dismal Swamp, Virginia	27	21	14.7	4.5	9 x 3	9.8	4.3	5.1	7.1	9.6	4
Do.	do.	26.2	20.3	14.2	3.6	9.7 x 3	9.4	4.3	5	7.2	9	3.9
P. n. aureolus	Milton, Fla	26	20.4	13.9	4.2	7.9 x 2.7	9.2	4.1	4.8	7.1	9.2	3.4
Do.	Beebe, Ark	25.3	19.5	13.1	4.1	8.9 x 2.3	9.6	3.9	4.7	6.9	9	3.7
SUBGENUS PODOMYS.												
P. floridanus	Enterprise, Fla	30.6	22.9	14.9	4.9	9.7 x 2.9	11.7	4.8	5.7	7.9	10.3	4.4
Do.	do.	28.9	21.5	14.9	4.6	9 x 3	11	4.3	5.6	7	9.9	4.6
SUBGENUS HAPLOMYLOMYS.												
P. californicus	Monterey, Calif	31	25	16	4.7	11 x 4	11.2	4.6	6.3	8.3	11.6	4.7
P. c. insignis	Dulzura, Calif	28.5	21.5	14.2	4.5	10.2 x 3	10.3	4.1	5.6	7	10.2	4
P. eremicus	Hardy River, Lower California	25.7	19.5	12.7	3.9	9.5 x 2.6	9.4	4.1	4.7	6	8.9	3.9
P. e. cedrosensis	Cerros Island, Lower California	25.8	19.2	13.3	4	....	10.4	3.9	5.2	6.8	8.2	3.7
P. e. eva	Santa Anita, Lower California	25	19.3	12.7	4	8.9 x 2.7	9.2	3.5	5.1	6.2	9	3.3
P. e. insulicola [a]	Espiritu Santo Island, Lower Caliornia	25.9	19.3	12.4	3.9	9.3 x 3.3	9.5	3.5	5.2	6.3	9.2	3.6
P. e. avius [a]	Ceralbo Island, Lower California	25.9	20	13.4	4	9 x 3.3	8.9	4	4.8	6.5	9.2	4
P. e. polypolius [a]	Margarita Island, Lower California	24	18	12.2	4	9.4 x 3	8.7	3.7	4.8	5.8	8	3.9
P. e. tiburonensis [a]	Tiburon Island, Sonora	24	18.2	12	....	....	8	....	....	....	....	3.4
P. goldmani [a]	Alamos, Sonora	27.3	21.1	14.2	4	8.6 x 3.2	9.6	4.2	5	6.6	10	4
SUBGENUS BAIOMYS.												
P. taylori	Brownsville, Tex	18.5	14.3	9.9	3.4	5.6 x 1.6	6.5	2.7	4	4.6	6.5	3
P. t. subater [a]	Near Columbia, Tex	18	13.6	10	3.5	5.5 x 1.5	6.8	2.5	4	4.4	6.1	3
P. t. paulus [a]	Rio Sestin, Durango	18	14	9.5	3.6	6 x 1.4	6	2.8	3.8	4	6.3	3
P. t. analogus [a]	Zamora, Michoacan	18	14	9.8	3.3	5.9 x 2	6.2	2.6	3.5	4.5	6	2.9
P. musculus [a]	Colima, Colima	21	15.7	11.5	3.8	8 x 2.3	8	3.2	4.2	4.9	7	3.2
P. m. brunneus [a]	Jalapa, Veracruz	19.8	15	10.5	3.9	7 x 1.5	7	2.8	4.2	4.5	7	3
P. m. nigrescens [a]	Comitan, Chiapas	20.1	15.2	10.5	3.4	6.4 x 2.1	8	2.8	4.3	....	....	3.2

[a] Type.



SKULLS OF PEROMYSCUS.

1. P. maniculatus.
2. P. m. arcticus.
3. P. m. austerus.
4. P. m. hylaeus.
5. P. m. gracilis.
6. P. m. hollisteri.
7. P. sitkensis.
8. P. m. keeni.
9. P. m. pallescens.
10. P. m. bairdi.
11. P. polionotus.
12. P. m. gambeli.

PLATE III.

[About one and one-third times natural size.]

FIG. 1. *Peromyscus leucopus tornillo* Mearns. Juarez, Chihuahua, Mexico. Adult male. (No. 58368 U. S. Nat. Mus., Biological Survey Coll.)

2. *Peromyscus gossypinus* (Le Conte). Riceboro, Ga. Adult male. (No. 45081 U. S. Nat. Mus., Biological Survey Coll.)

3. *Peromyscus leucopus cozumelæ* Merriam. Topotype. Cozumel Island, off Yucatan, Mexico. Adult female. (No. 108440 U. S. Nat. Mus., Biological Survey Coll.)

4. *Peromyscus leucopus mesomelas* Osgood. Topotype. Orizaba, Veracruz, Mexico. (No. 58208 U. S. Nat. Mus., Biological Survey Coll.)

5. *Peromyscus oaxacensis* Merriam. Topotype. Cerro San Felipe, Oaxaca, Mexico. Adult female. (No. 68598 U. S. Nat. Mus., Biological Survey Coll.)

6. *Peromyscus lophurus* Osgood. Type. Todos Santos, Guatemala. Adult male. (No. 77219 U. S. Nat. Mus., Biological Survey Coll.)

7. *Peromyscus simulatus* Osgood. Type. Jico, Veracruz, Mexico. Adult female. (No. 55028 U. S. Nat. Mus., Biological Survey Coll.)

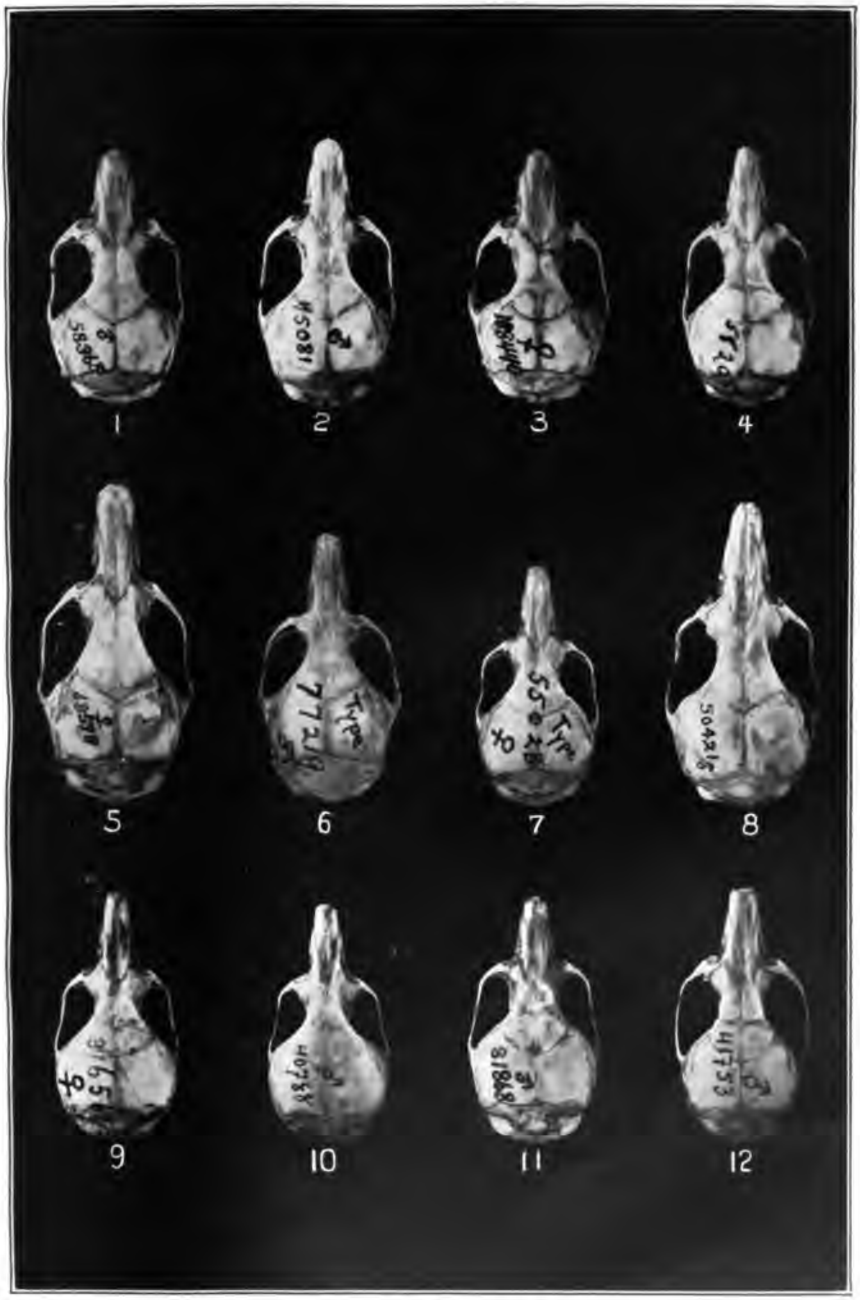
8. *Peromyscus hylocetes* Merriam. Topotype. Patzcuaro, Michoacan, Mexico. Adult male. (No. 50421 U. S. Nat. Mus., Biological Survey Coll.)

9. *Peromyscus crinitus* (Merriam). Topotype. Shoshone Falls, Idaho. Adult female. (No. 31656 U. S. Nat. Mus., Biological Survey Coll.)

10. *Peromyscus crinitus stephensi* Mearns. Panamint Mountains, California. Adult male. (No. 40788 U. S. Nat. Mus., Biological Survey Coll.)

11. *Peromyscus eremicus* (Baird). Hardy River, Lower California, Mexico. Adult male. (No. 81868 U. S. Nat. Mus., Biological Survey Coll.)

12. *Peromyscus leucopus texanus* (Woodhouse). Brownsville, Tex. Adult male. (No. 41753 U. S. Nat. Mus., Biological Survey Coll.)



SKULLS OF PEROMYSCUS.

1. P. l. tornillo.
2. P. gossypinus.
3. P. l. cozumelæ.
4. P. l. mesomelas.
5. P. oaxacensis.
6. P. lophurus.
7. P. simulatus.
8. P. hylocetes.
9. P. crinitus.
10. P. c. stephensi.
11. P. eremicus.
12. P. l. texanus.

PLATE IV.

[About one and one-third times natural size.]

FIG. 1. *Peromyscus boylei* (Baird). Topotype. Middle Fork American River, California. Adult male. (No. 43232 U. S. Nat. Mus., Biological Survey Coll.)

2. *Peromyscus boylei levipes* Merriam. Type. Mount Malinche, Tlaxcala, Mexico. Adult male. (No. 53673 U. S. Nat. Mus., Biological Survey Coll.)

3. *Peromyscus boylei spicilegus* Allen. Topotype. San Sebastian, Jalisco, Mexico. Adult female. (No. 58543 U. S. Nat. Mus., Biological Survey Coll.)

4. *Peromyscus boylei simulus* Osgood. Type. San Blas, Tepic, Mexico. Adult male. (No. 88088 U. S. Nat. Mus., Biological Survey Coll.)

5. *Peromyscus boylei aztecus* (Saussure). Topotype. Mirador, Veracruz, Mexico. Adult female. (No. 58543 U. S. Nat. Mus., Biological Survey Coll.)

6. *Peromyscus truei* (Shufeldt). Topotype. Fort Wingate, N. Mex. Adult female. (No. 46789 U. S. Nat. Mus., Biological Survey Coll.)

7. *Peromyscus pectoralis cremicoides* Osgood. Type. Mapimi, Durango, Mexico. Adult male. (No. 57729 U. S. Nat. Mus., Biological Survey Coll.)

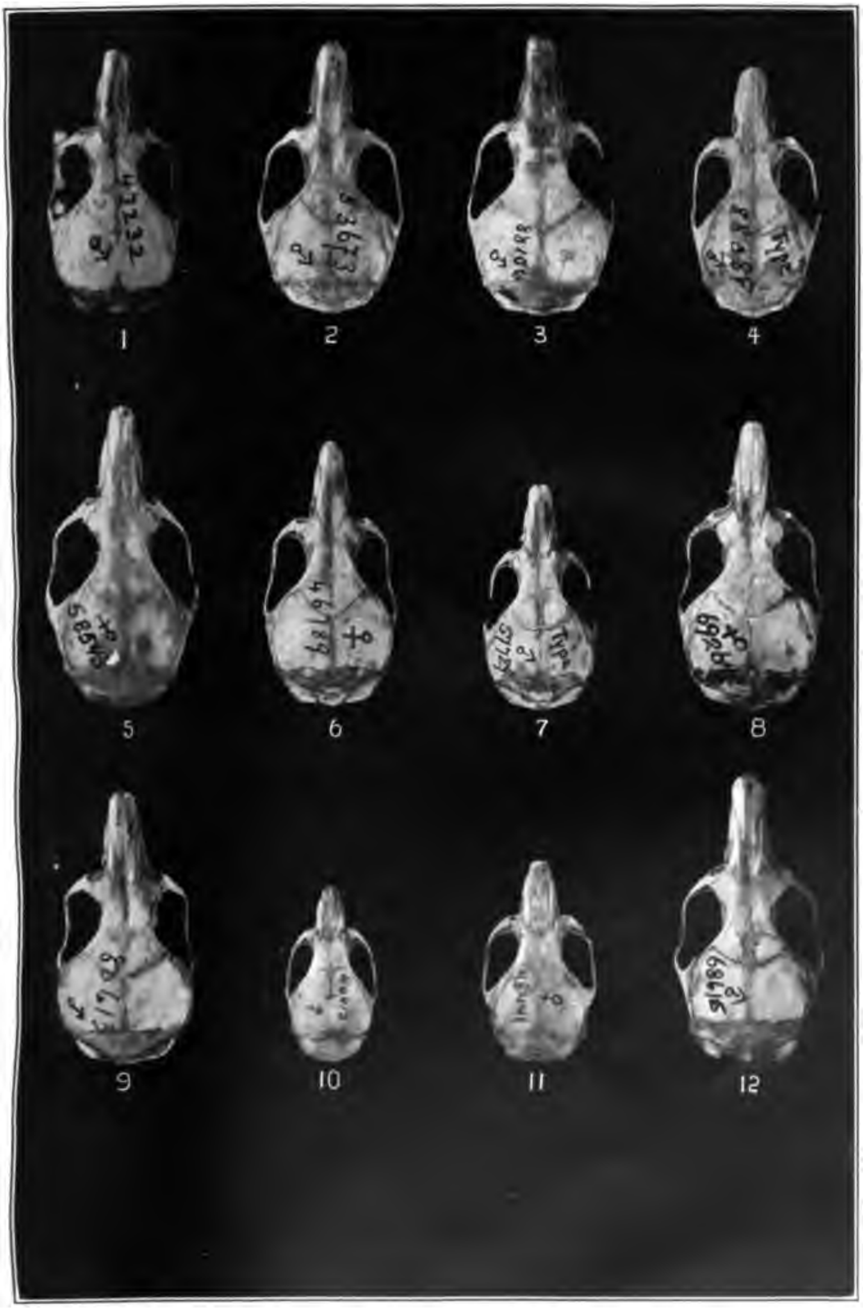
8. *Peromyscus nasutus* (Allen). Gold Hill, Colo. Adult female. (No. 69264 U. S. Nat. Mus., Biological Survey Coll.)

9. *Peromyscus truei gratus* Merriam. Topotype. Tlalpam, D. F., Mexico. Adult male. (No. 50613 U. S. Nat. Mus., Biological Survey Coll.)

10. *Peromyscus taylori* (Thomas). Brownsville, Tex. Adult female. (No. 48813 U. S. Nat. Mus., Biological Survey Coll.)

11. *Peromyscus musculus* Merriam. Topotype. Armeria, Colima, Mexico. Adult female. (No. 45441 U. S. Nat. Mus., Biological Survey Coll.)

12. *Peromyscus lepturus* Merriam. Topotype. Mount Zempoaltepec, Oaxaca, Mexico. Adult male. (No. 68615 U. S. Nat. Mus., Biological Survey Coll.)



SKULLS OF PEROMYSCUS.

1. **P. boylei.**
2. **P. b. levipes.**
3. **P. b. spicilegus.**
4. **P. b. simulus.**
5. **P. b. aztecus.**
6. **P. truei.**
7. **P. p. eremicoides.**
8. **P. nasutus.**
9. **P. t. gratus.**
10. **P. taylori.**
11. **P. musculus.**
12. **P. lepturus.**

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PLATE V.

[About one and one-third times natural size.]

FIG. 1. *Peromyscus banderanus* Allen. Hacienda Magdalena, Colima, Mexico. Adult male. (No. 45336 U. S. Nat. Mus., Biological Survey Coll.)

2. *Peromyscus guatemalensis* Merriam. Topotype. Todos Santos, Guatemala. (No. 76852 U. S. Nat. Mus., Biological Survey Coll.)

3. *Peromyscus melanophrys* (Coues). Yaganiza, Oaxaca, Mexico. Adult male. (No. 68606 U. S. Nat. Mus., Biological Survey Coll.)

4. *Peromyscus yucatanicus* Allen and Chapman. La Vega, Yucatan, Mexico. Adult female. (No. 108424 U. S. Nat. Mus., Biological Survey Coll.)

5. *Peromyscus megalops* Merriam. Mountains near Chilpancingo, Guerrero, Mexico. Adult male. (No. 70188 U. S. Nat. Mus., Biological Survey Coll.)

6. *Peromyscus difficilis* (Allen). Topotype. Valparaiso Mountains, Zacatecas, Mexico. Adult female. (No. 91829 U. S. Nat. Mus., Biological Survey Coll.)

7. *Peromyscus furvus* Allen and Chapman. Jico, Veracruz, Mexico. Adult female. (No. 55021 U. S. Nat. Mus., Biological Survey Coll.)

8. *Peromyscus mexicanus* (Saussure). Topotype. Mirador, Veracruz, Mexico. Adult male. (No. 58547 U. S. Nat. Mus., Biological Survey Coll.)

9. *Peromyscus* (*Peromyscus*) *leucopus noveboracensis* (Fischer). Montauk Point, New York. Adult male. (No. 56714 U. S. Nat. Mus., Biological Survey Coll.)

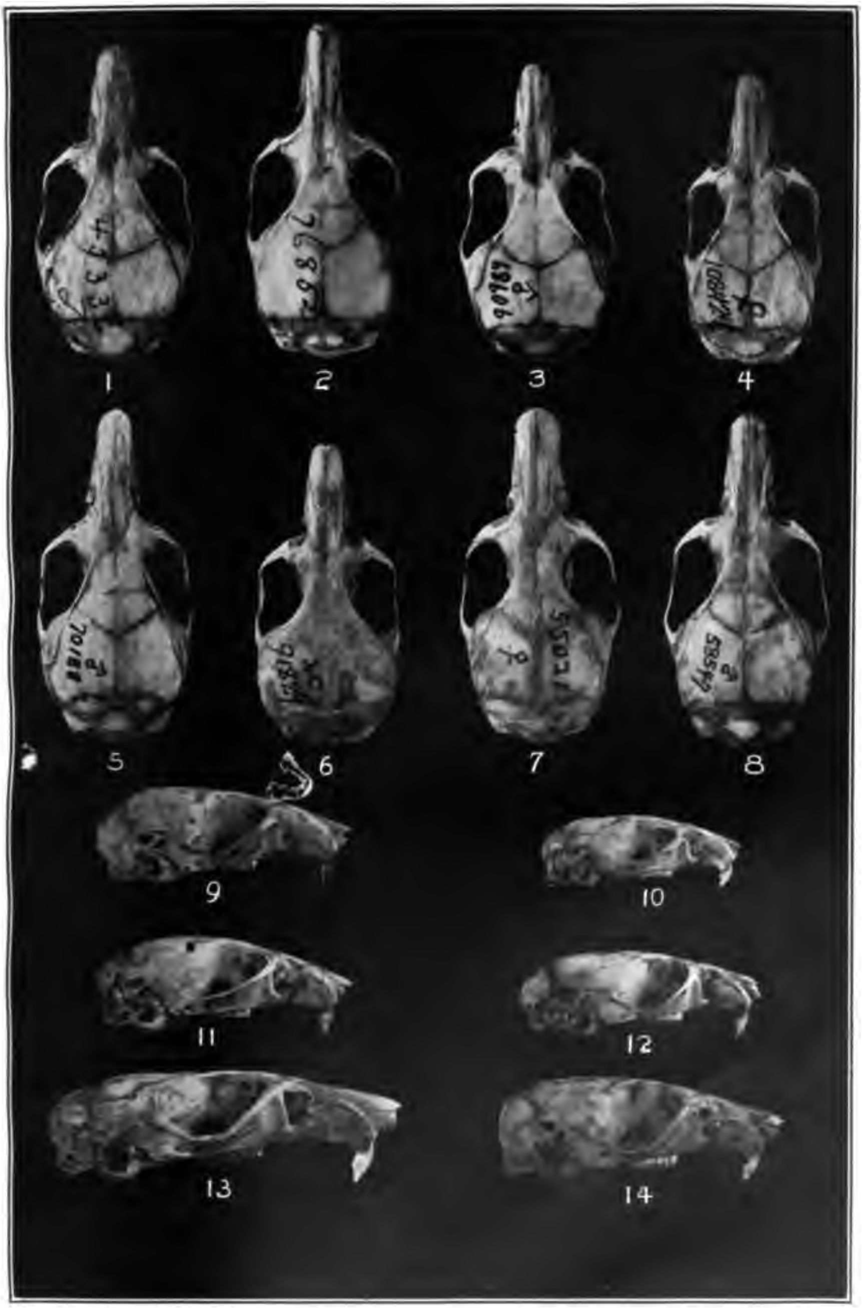
10. *Peromyscus* (*Baiomys*) *musculus* (Merriam). Armeria, Colima, Mexico. Adult female. (No. 45441 U. S. Nat. Mus., Biological Survey Coll.)

11. *Peromyscus* (*Ochrotomys*) *nuttalli* (Harlan). Dismal Swamp, Virginia. Adult male. (No. 75198 U. S. Nat. Mus., Biological Survey Coll.)

12. *Peromyscus* (*Haplomylomys*) *eremicus* (Baird). Hardy River, Lower California, Mexico. Adult male. (No. 81868 U. S. Nat. Mus., Biological Survey Coll.)

13. *Peromyscus* (*Megadontomys*) *thomasi* Merriam. Topotype. Mountains near Chilpancingo, Guerrero, Mexico. Adult female. (No. 70413 U. S. Nat. Mus., Biological Survey Coll.)

14. *Peromyscus* (*Podomys*) *floridanus* (Chapman). Cape Canaveral, Florida. Adult female. (No. 23416 U. S. Nat. Mus., Biological Survey Coll.)



SKULLS OF PEROMYSCUS.

1. P. banderanus.
2. P. guatemalensis.
3. P. melanophrys.
4. P. yucatanicus.
5. P. megalops.
6. P. difficilis.
7. P. furvus.
8. P. mexicanus.
9. P. l. noveboracensis.
10. P. musculus.
11. P. nuttalli.
12. P. eremicus.
13. P. thomasi.
14. P. floridanus.

PLATE VI.

[About one and one-third times natural size.]

FIG. 1. *Peromyscus* (*Peromyscus*) *zarhynchus* Merriam. Topotype. San Cristobal, Chiapas, Mexico. Adult male. (No. 76097 U. S. Nat. Mus., Biological Survey Coll.)

2, 2 A. *Peromyscus* (*Megadontomys*) *flavidus* Bangs. Topotype. Boquete, Chiriqui, Panama. (No. 10331 Mus. Comp. Zool., Cambridge, Mass.)

3, 3 A. *Peromyscus* (*Megadontomys*) *thomasi* Merriam. Topotypes. Mountains near Chilpancingo, Guerrero, Mexico. (3. No. 70144; 3a. No. 70143 U. S. Nat. Mus., Biological Survey Coll.)

4. *Peromyscus* (*Peromyscus*) *leucopus* (Rafinesque). Houma, La. Adult female. (No. 46011 U. S. Nat. Mus., Biological Survey Coll.)

5, 5 A. *Peromyscus* (*Haplomylomys*) *californicus* (Gambel.) Topotype. Monterey, Calif. Adult male. (No. 44777 U. S. Nat. Mus., Biological Survey Coll.)

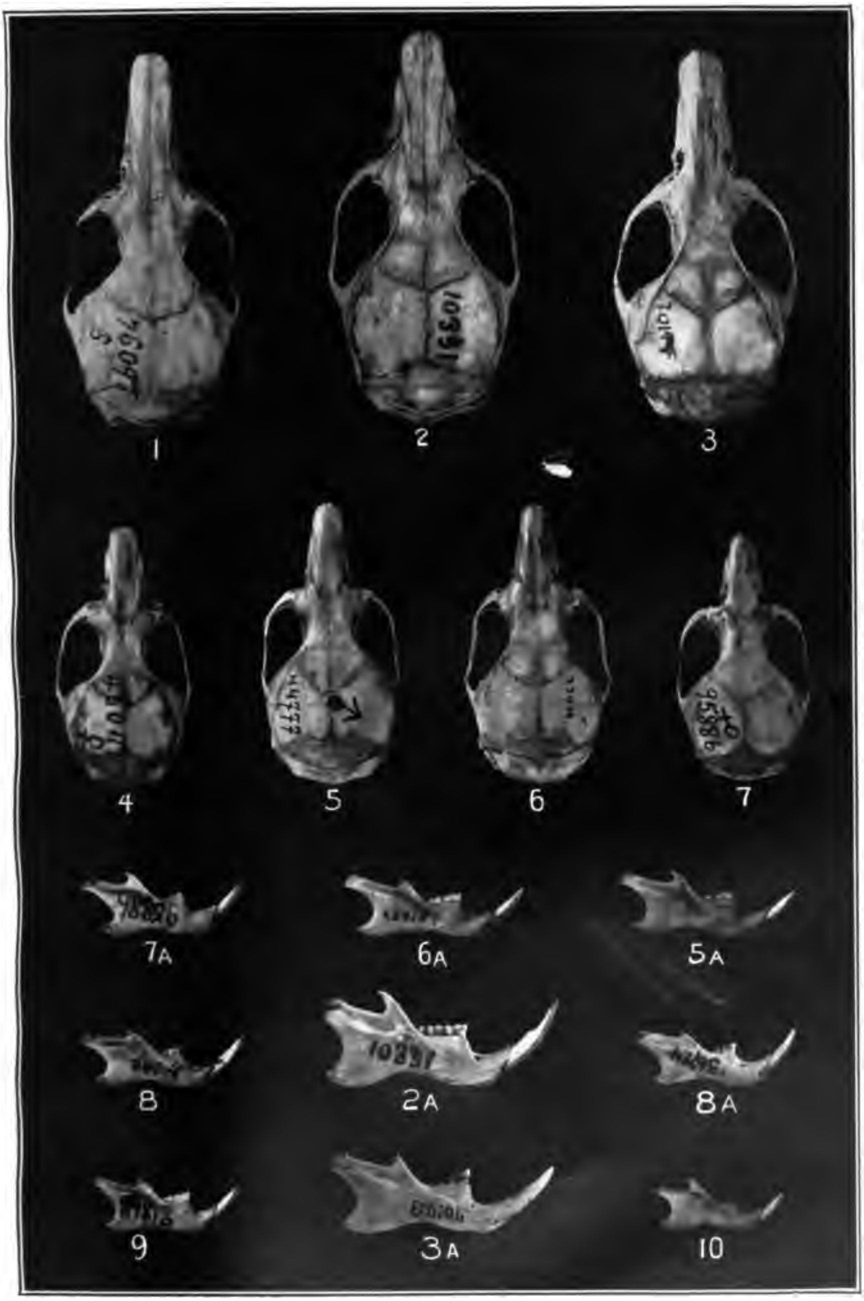
6, 6 A. *Peromyscus* (*Podomys*) *floridanus* (Chapman). Cape Canaveral, Florida. Adult female. (No. 23416 U. S. Nat. Mus., Biological Survey Coll.)

7, 7 A. *Peromyscus* (*Ochrotomys*) *nuttalli* (*Harlan*). Dismal Swamp, Virginia. Adult female. (No. 95886 U. S. Nat. Mus., Biological Survey Coll.)

8, 8 A. *Peromyscus* (*Peromyscus*) *leucopus noveboracensis* (Fischer). Jaw. 8. East Hartford, Connecticut. Adult male. (No. 64349 U. S. Nat. Mus., Biological Survey Coll.) 8A. Montauk Point, New York. Adult male. (No. 56714 U. S. Nat Mus., Biological Survey Coll.)

9. *Peromyscus* (*Haplomylomys*) *eremicus* (Baird). Jaw. Hardy River, Lower California, Mexico. Adult male. (No. 81868 U. S. Nat. Mus., Biological Survey Coll.)

10. *Peromyscus* (*Baiomys*) *musculus* (Merriam). Jaw. Armeria, Colima, Mexico. Adult female. (No. 45441 U. S. Nat. Mus., Biological Survey Coll.)



SKULLS AND JAWS OF PEROMYSCUS.

1. P. zarhynchus.
2, 2A. P. flavidus.
3, 3A. P. thomasi.
4. P. leucopus.
5, 5A. P. californicus.
6, 6A. P. floridanus.
7, 7A. P. nuttalli.
8, 8A. P. l. noveboracensis.
9. P. eremicus.
10. P. musculus.

PLATE VII.

[About one and one-third times natural size.]

FIG. 1. *Peromyscus floridanus* (Chapman). Cape Canaveral, Florida. Adult female. (No. 23416 U. S. Nat. Mus., Biological Survey Coll.)

2. *Peromyscus nuttalli* (Harlan). Dismal Swamp, Virginia. Adult male. (No. 75198 U. S. Nat. Mus., Biological Survey Coll.)

3. *Peromyscus leucopus noveboracensis* (Fischer). East Hartford, Conn. Adult male. (No. 64349 U. S. Nat. Mus., Biological Survey Coll.)

4. *Peromyscus eremicus* (Baird). Hardy River, Lower California, Mexico. Adult male. (No. 81868 U. S. Nat. Mus., Biological Survey Coll.)

5. *Peromyscus thomasi* Merriam. Topotype. Mountains near Chilpancingo, Guerrero, Mexico. Adult male. (No. 70144 U. S. Nat. Mus., Biological Survey Coll.)

6. *Peromyscus mexicanus* (Saussure). Topotype. Mirador, Veracruz, Mexico. Adult male. (No. 58547 U. S. Nat. Mus., Biological Survey Coll.)

7. *Peromyscus bullatus* Osgood. Type. Perote, Veracruz, Mexico. Adult female. (No. 54405 U. S. Nat. Mus., Biological Survey Coll.)

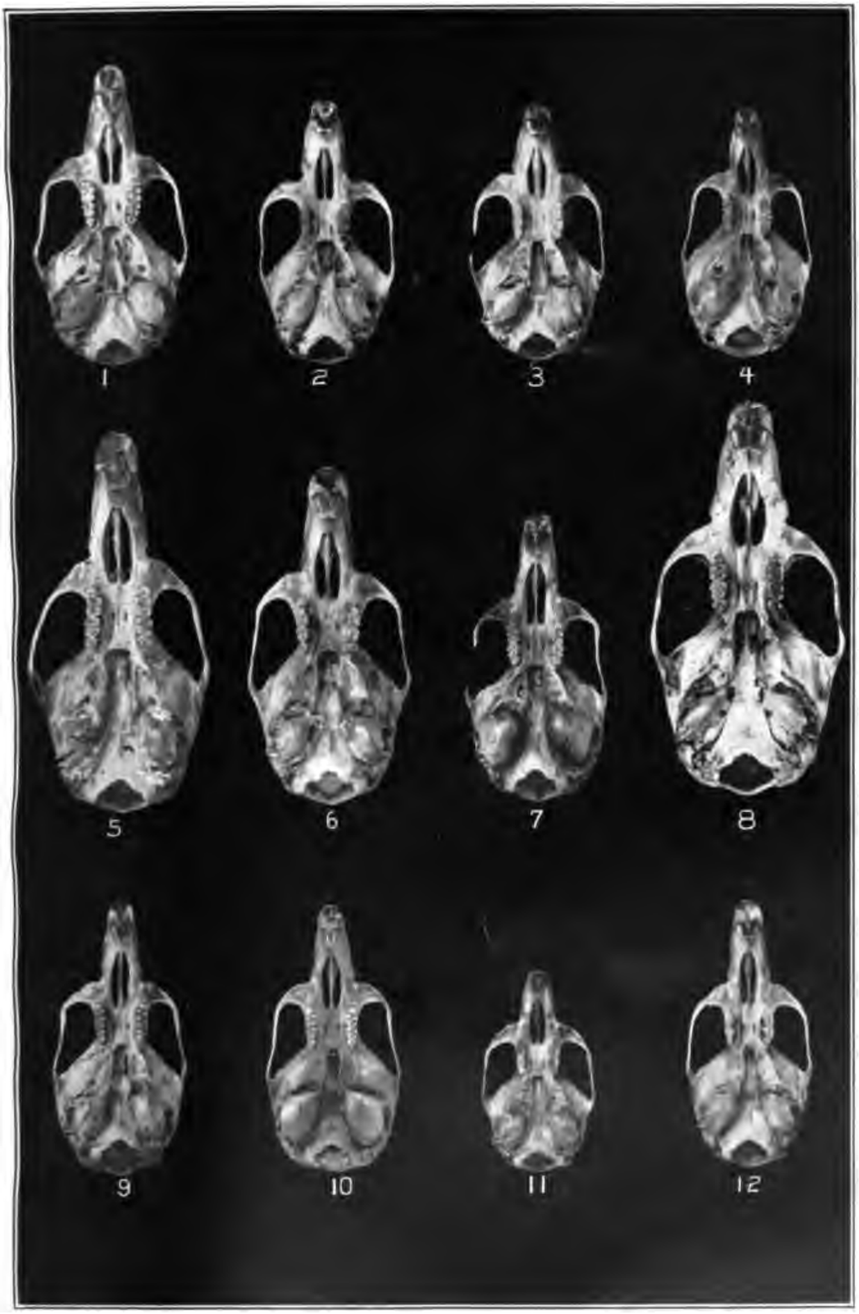
8. *Peromyscus flavidus* Bangs. Topotype. Boquete, Chiriqui, Panama. (No. 10331 Mus. Comp. Zool., Cambridge, Mass.)

9. *Peromyscus boylei* (Baird). Topotype. Middle Fork American River, California. Adult male. (No. 43232 U. S. Nat. Mus., Biological Survey Coll.)

10. *Peromyscus truei* (Shufeldt). Topotype. Fort Wingate, N. Mex. Adult female. (No. 46789 U. S. Nat. Mus., Biological Survey Coll.)

11. *Peromyscus musculus* (Merriam). Armeria, Colima, Mexico.. Adult female. (No. 45441 U. S. Nat. Mus., Biological Survey Coll.)

12. *Peromyscus maniculatus gracilis* (Le Conte). Mountain View, N. Y. Adult female. (No. 93635 U. S. Nat. Mus., Biological Survey Coll.)



SKULLS OF PEROMYSCUS.

1. P. floridanus.	5. P. thomasi.	9. P. boylei.
2. P. nuttalli.	6. P. mexicanus.	10. P. truei.
3. P. l. noveboracensis.	7. P. bullatus.	11. P. musculus.
4. P. eremicus.	8. P. flavidus.	12. P. m. gracilis.

PLATE VIII.

[Teeth about seven and one-half times natural size; soles about two and one-half times.]

FIGS. 1, 1a, 1b, 1c. *Peromyscus* (*Megadontomys*) *thomasi* Merriam.
- 1. Side view of upper molars. (No. 126887 U. S. Nat. Mus., Biological Survey Coll.)
- 1a. Worn crowns of upper molars. (No. 126889 U. S. Nat. Mus., Biological Survey Coll.)
- 1b. Worn crowns of lower molars. (No. 126889 U. S. Nat. Mus., Biological Survey Coll.)
- 1c. Sole of hind foot. (No. 126889 U. S. Nat. Mus., Biological Survey Coll.)

2, 2a, 2b, 2c. *Peromyscus* (*Peromyscus*) *leucopus noveboracensis* (Fischer).
- 2. Side view of upper molars. (No. 44939 U. S. Nat. Mus., Biological Survey Coll.)
- 2a. Worn crowns of upper molars. (No. 96930 U. S. Nat. Mus., Biological Survey Coll.)
- 2b. Worn crowns of lower molars. (No. 96929 U. S. Nat. Mus., Biological Survey Coll.)
- 2c. Sole of hind foot. (No. 82924 U. S. Nat. Mus., Biological Survey Coll.)

3. *Peromyscus eremicus* (Baird). Side view of upper molars. (No. 81870 U. S. Nat. Mus., Biological Survey Coll.)

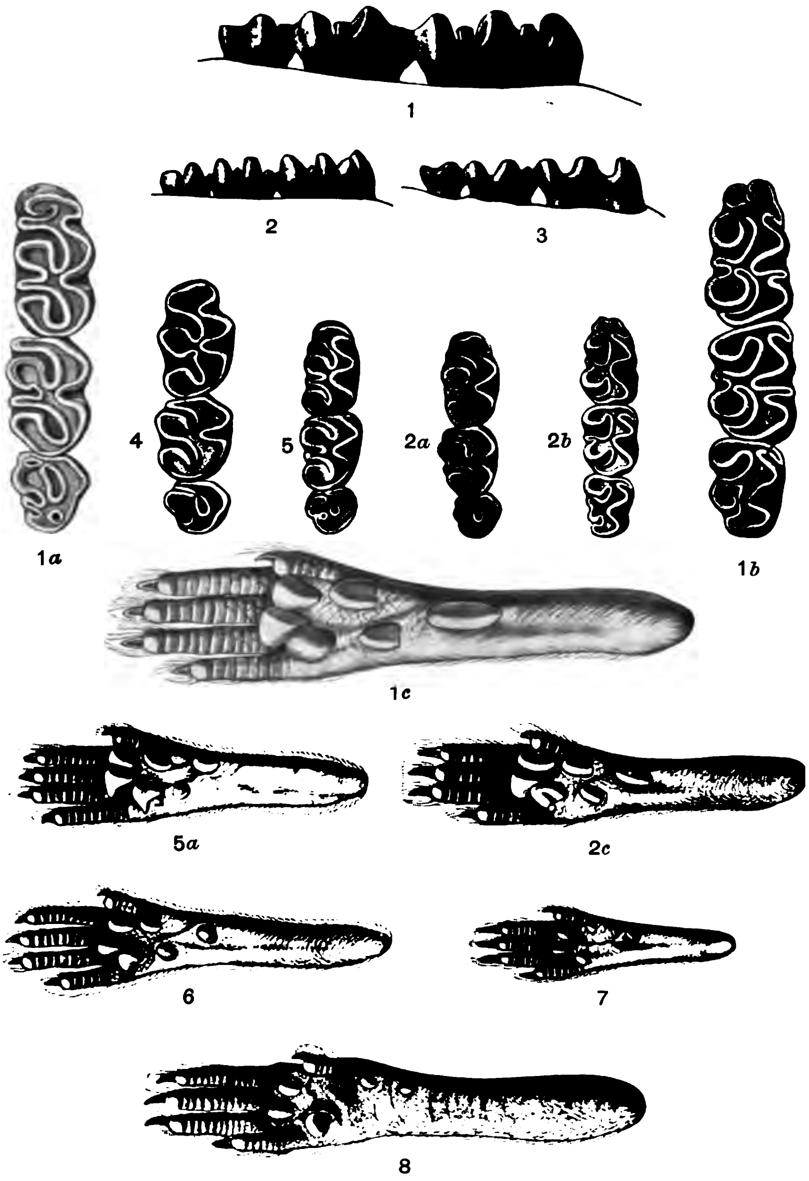
4. *Peromyscus* (*Haplomylomys*) *californicus* Gambel. Crowns of upper molars. (No. 97134 U. S. Nat. Mus., Biological Survey Coll.)

5, 5a. *Peromyscus* (*Ochrotomys*) *nuttalli* (Harlan).
- 5. Worn crowns of upper molars. (No. 75198 U. S. Nat. Mus., Biological Survey Coll.)
- 5a. Sole of hind foot. (No. 140805 U. S. Nat. Mus., Biological Survey Coll.)

6. *Peromyscus* (*Peromyscus*) *maniculatus gracilis* (Le Conte). Sole of hind foot. (No. 147327 U. S. Nat. Mus., Biological Survey Coll.)

7. *Peromyscus* (*Baiomys*) *taylori* (Thomas). Sole of hind foot. (No. 18287 U. S. Nat. Mus.)

8. *Peromyscus* (*Podomys*) *floridanus* Chapman. Sole of hind foot. (No. 111458 U. S. Nat. Mus.)



F. von Itersen, del.

MOLAR TEETH AND SOLES OF PEROMYSCUS.

1, 1*a*, 1*b*, 1*c*. P. thomasi.
2, 2*a*, 2*b*, 2*c*. P. l. noveboracensis.
3. P. eremicus.
4. P. californicus.
5, 5*a*. P. nuttalli.
6. P. m. gracilis.
7. P. taylori.
8. P. floridanus.

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[New names in **black face type**; synonyms in *italics*.]

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U. S. DEPARTMENT OF AGRICULTURE
BUREAU OF BIOLOGICAL SURVEY

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THE RABBITS OF NORTH AMERICA

BY

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Prepared under the direction of
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WASHINGTON
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1909

LETTER OF TRANSMITTAL

U. S. Department of Agriculture,
Bureau of Biological Survey,
Washington, D. C., April 25, 1909.

Sir: I have the honor to transmit herewith for publication as North American Fauna No. 29 a revision of The Rabbits of North America, by E. W. Nelson, Chief Field Naturalist of the Biological Survey. Rabbits inhabit nearly all parts of North America, where they have become adapted to both mountains and lowlands, and to the varied physical and climatic conditions from the tropical forests to the arctic tundras, and from the humid marshes of the seacoast to the arid deserts of the interior. Many of the species are destructive to nursery stock and other agricultural crops; as an offset, their flesh has considerable food value, furnishing an acceptable article of diet to thousands of our people.

Heretofore there has been no treatise by means of which our American rabbits could be identified; the present revision, therefore, will prove not only a much needed addition to zoological literature but also a welcome aid to all who have occasion to identify or study these animals.

Respectfully,

C. Hart Merriam,
Chief, Biological Survey.

Hon. James Wilson,
Secretary of Agriculture.

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No. 29. NORTH AMERICAN FAUNA. AUGUST, 1909.

THE RABBITS OF NORTH AMERICA.

By E. W. NELSON.

INTRODUCTION.

Hares and rabbits are generally distributed throughout most of the United States, and often become excessively numerous, especially in the West. Wherever they exist in large numbers in an agricultural section they are extremely destructive to crops, fruit trees, nurseries, and forest seedlings, and thus possess considerable economic importance. The habits of the several species vary widely, however, and some are comparatively harmless. The investigations of the Biological Survey into the relations of these mammals to agriculture and forestry have been hampered by the imperfect information available concerning the number of existing species and their distribution. It thus became necessary to study the group in detail. Several years ago Dr. C. Hart Merriam, Chief of the Biological Survey, did much work on the rabbits with the intention of monographing the group, but other affairs interfered. Since then much new material has been collected and the group was finally placed in my hands for revision. Throughout this work Doctor Merriam has given me the benefit of his knowledge of the group in helpful criticisms and suggestions.

The present revision includes all of the known hares and rabbits of North America, from the Isthmus of Panama to north Greenland. Although among the commonest of North American mammals, yet up to within comparatively few years they were represented in collections by extremely scanty and imperfect material. Owing to this, the ranges of only a few species were well known, and the relationships of a large number of species and their geographic races were little understood. In 1877 Dr. J. A. Allen published a monograph of the North American Leporidæ[a] covering the same area as the present paper. The material then available for study was so limited that for the entire continent Doctor Allen recognized only 18 species and 'varieties.' In the present monograph 97 species and subspecies are recognized, two or three of which, in the light of more satisfactory material, may prove unworthy of retention in the list.

The active field work of the last twenty years has resulted in the accumulation in American museums of superb series of North American mammals. The wealth of material in these collections is apparent from the fact that in the preparation of this monograph I have been able to examine more than 5,500 specimens, of which about 3,500 are skins with skulls; the others are odd skulls. Good series of specimens are now available from nearly all parts of Canada, the United States, Mexico, and, to a less extent, from Central America. Representatives of every species and subspecies recognized here have been examined. In some instances only a single specimen, usually the type, has been seen, but in the majority of cases series have been examined. For instance, I have had the use of 170 specimens of the Texas jack rabbit (*L. c. texianus*) and 345 specimens of the Mackenzie varying hare (*L. a. macfarlani*). Still, numerous gaps exist, sometimes including areas of considerable size, from which no specimens have been seen. The existing collections, however, cover the continent so completely that for the first time it is possible to determine most of the previously unsettled questions of distribution and relationship. Considerable detailed field work is still necessary, however, to secure material for the solution of many minor problems.

The majority of the type specimens of North American hares and rabbits are still extant and in the possession of American museums, so that I have had access to them. The types of about three-fourths of the total number of recognized forms, and also those of various synonyms, have been examined. The types of about a dozen rabbits described from North America are in European museums, mainly in London and Berlin. Fortunately, while I was preparing the present monograph, Mr. W. H. Osgood visited Europe and examined and made notes on several important types, and thus obtained information which fixes the status of several names. In a limited number of species the names were based on descriptions with no type mentioned; or the types, if named, are no longer extant; but in all such cases material is available from the locality or region whence came the original specimens. By far the most extensive and complete series of specimens is that of the Biological Survey collection, in which 90 species and subspecies are represented. Three additional species are in the United States National Museum, so that the National collections contain 93 out of the 97 recognizable species and subspecies of North American rabbits.

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[a] Monograph of North American Rodentia, 1877.

The abundant recent material in the National Museum, exclusive of that of the Biological Survey, consists largely of the fine collections made by Dr. E. A. Mearns on the Mexican boundary and elsewhere. Many important points in regard to the ranges and relationships of species would have remained undetermined but for the generous loan of material from various museums and private collections. It is therefore a pleasant duty to acknowledge with sincerest thanks the courtesy of Prof. John Macoun, Canadian Geological Survey; Dr. J. A. Allen, American Museum of Natural History; Mr. Samuel Henshaw and Mr. Outram Bangs, Museum of Comparative Zoology; Mr. Witmer Stone, Academy of Natural Sciences, Philadelphia; Dr. D. G. Elliot, Field Museum of Natural History; Prof. A. G. Ruthven, University of Michigan; Prof. L. L. Dyche, University of Kansas; Mr. H. G. Smith, State Historical and Natural History Society, Denver; Mr. W. E. Clyde Todd, Carnegie Museum, Pittsburg; Mr. M. W. Lyon, United States National Museum; Mr. E. R. Warren, Colorado Springs, Colorado; Mr. H. P. Attwater, Houston, Texas, and others. In addition I wish to express my appreciation of the constant assistance of Mr. N. Hollister, of the Biological Survey, in the laborious task of handling and comparing the great mass of material studied in the preparation of this paper.

RELATIONS OF AMERICAN RABBITS TO AGRICULTURE.

From the earliest settlement of America to the present day rabbits of various species have been more or less important as game, and have formed a valuable addition to the food supply. At the same time both cottontails and jack rabbits have long been blacklisted among the notorious enemies of the farmer and fruit grower. Cottontails live in practically all sections of the United States except parts of the northern border, and in many places are extremely numerous. They are serious pests to fruit growers on account of their fondness for the bark of trees and the tender growths of nursery stock. They also destroy young grapevines and garden crops. A good illustration of the damage to agriculture by cottontails was given in the summer of 1907 on a small ranch in the San Joaquin Valley, California, where the valley cottontails completely destroyed the vines on 3½ acres along one side of a young vineyard of 33 acres, the loss amounting to about $500. The widespread abundance of cottontails and their destructiveness in nearly all parts of their range make it evident that the aggregate annual loss from them in the entire country amounts to a very large sum. In some sections their persistent destruction of small seedling trees interferes seriously with the efforts of the Forest Service to reforest mountain slopes. Cottontails are less numerous and destructive in certain areas than in others, and some species are practically harmless, mainly because they live in sections where at present there is little or no agriculture.

Jack rabbits are much larger than cottontails, and are restricted to the region west of the Mississippi River. From the first arrival of farmers in the arid region of the West, jack rabbits have shown great fondness for growing crops. For this reason, even when present in comparatively small numbers, they cause considerable annual loss. They invade grainfields and often take up permanent residence in growing alfalfa. They destroy not only grain and forage crops but also vineyards, nurseries, and orchards. Jack rabbits sometimes become excessively abundant over large areas, notably in Texas, Colorado, Utah, Idaho, Oregon, and California. During the periods of abundance they do enormous damage to agriculture and even threaten the total destruction of crops. They are reported to have damaged the crops of Tulare County, California, to the amount of $600,000 in a single year, and one county in Idaho paid $30,000 in bounties on these pests in a year. In several parts of the West they have at times become so numerous and destructive that the people have organized public drives. Poundlike inclosures were set up, with wire fences leading to the entrances. The rabbits were then driven into the inclosures and killed by long lines of beaters. In this way as many as 20,000 jack rabbits have been killed in a single drive in the San Joaquin Valley, California.[a] The experience of Australia proves that rabbits are capable of destroying the agricultural welfare of great regions.

As an offset to the damage done by rabbits it should be stated that they have a high food value. They are the commonest and most widely distributed of our game animals, and during fall and winter countless thousands of them are sold in markets throughout the country. The total value of the rabbits thus sold in the United States, in addition to those consumed in the country, amounts to a large sum. It has recently been stated that about 2,000,000 varying hares are caught each winter in Maine, half of which are shipped out of the State.

Rabbits are usually most numerous in the arid West but often become extremely plentiful east of the Mississippi. During the winters from 1870 to 1874 I repeatedly saw farmers driving large wagons full of cottontails through the streets of Chicago and selling them at absurdly low prices. During recent years the demand for them has increased, so that they now command ready sale at good prices.

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[a] The Jack Rabbits of the United States, by T. S. Palmer. U. S. Biol. Survey Bull. No. 8, 1896, contains photographs of rabbit drives.

In addition to the value of rabbit flesh for food, their skins are extensively used. The fur forms the basis of felt for hats and the skin is used for making gelatine, jujube, sizing, and glue. In 1895 one of the leading furriers of New York estimated that 1,500,000 rabbit skins were collected annually for the trade, mainly in Maryland, Virginia, and North Carolina. In addition, during the same year, millions of rabbit skins were imported into this country to supply the demand. The skins vary in value from 1 to 5 cents each.

USE OF THE NAMES HARE AND RABBIT.

The terms hare and rabbit were first used to distinguish the two well-known European species *Lepus timidus* and *Lepus cuniculus* (now *Oryctolagus cuniculus*). The application of these terms has gradually broadened until they now have group significance, all members of the circumpolar genus *Lepus* belonging to the hares, while several genera, both of the Old World and of the New, are referable to the rabbits.

The essential characters relied upon by European authors to distinguish the Old World hares and rabbits are that hares live in forms and bring forth their young already provided with a well-developed coat of hair and with eyes open; while the rabbits, on the other hand, live in burrows and bring forth their young naked and with eyes closed. These writers have agreed in stating that all American members of the Leporidæ are hares, and some of them have assumed and stated as a fact that their young are born in the same condition as those of the Old World hares. In reality this is probably true only of the American species belonging to the genus *Lepus* as here restricted to include the jack rabbits and the varying and arctic hares. The facts given below prove that three species of the genus *Sylvilagus* bring forth their young naked and blind, as do the European rabbits, and it is fairly safe to assume that all other members of the genus do the same. In addition, the habits of the genera *Brachylagus* and *Romerolagus* make it more than probable that in this particular they agree with *Sylvilagus*. While some of the species of the American genus *Sylvilagus* commonly use forms, all make more or less use of burrows, usually the deserted homes of other mammals, or of shelters under rocks, roots of trees, and similar places. They often enlarge the ready-made shelter they occupy, but *Brachylagus* and *Romerolagus* are known to make their own burrows or tunnels, and even some of the cottontails have been known to make shallow burrows.

Taking the condition of the young at birth as a criterion, it thus appears that the term rabbit can be properly used in a general way to apply to all the species which have the burrowing habit more or less pronounced and which bring forth blind and naked young; while the term hare should be restricted to the species which practically always use forms instead of burrows and bear young well clothed with fur and with eyes open at birth. Common usage is thus correct in applying the term rabbit to the American cottontails and their small relatives of North and South America. So much for the technical value of common names; but in the untechnical terminology of the people 'rabbit' is of practically universal use in the United States, with modifying terms according to the species. 'Jack rabbit,' 'white-tailed jack rabbit,' and 'snowshoe rabbit' are names used for species which are technically hares, but attempts to change names in common usage for book names are worse than useless. In the case of the common varying and arctic hares, no good and generally accepted common names appear to be available. In Mexico the proper distinction is in common use, and the jack rabbits are called liebre (hare) and the cottontails conejo (rabbit).

CONDITION OF THE YOUNG AT BIRTH.

It is well known that the arctic hares, jack rabbits, and varying hares bring forth their young fully clothed with hair and with their eyes open, but I have been unable to find any satisfactory published information on the condition of young cottontails at birth. Fortunately, however, it has been possible to gather sufficient evidence to make it practically certain that young cottontails are born naked and blind.

In a letter dated February 27, 1906, Mr. Howard Lacey, of Kerrville, Texas, says: "I have read somewhere that the cottontail brings forth its young like the jack rabbit and our hare at home [England], with the eyes open and a good coat of fur on them. I have often found them here blind and naked, like our old-country rabbits." The cottontail referred to by Mr. Lacey is *Sylvilagus floridanus chapmani.*

A recent letter from Mr. J. D. Mitchell, Victoria, Texas, adds further information concerning the condition of the newly born young of this subspecies, as follows: "In 1861 to 1862, my brother and myself used the four walls of an old concrete gin house on our plantation in Lavaca County, Texas, as a rabbit pen. In this we kept from 20 to 30 adult rabbits. In those two years I believe I witnessed every phase in the domestic life of the cottontails. * * * I have watched the mother rabbit build her nest—have handled the young before they were dry. * * * I am sure that the young come into the world naked, blind, and helpless. The skin was usually dark where the brown fur would be, but the fur had not reached the outer surface. When suckling her young, the mother rabbit does not scratch away the weed and grass covering to the nest, but skillfully raises it and gets under it, curling herself around the outside of the nest and cuddling her young to the center, keeping the cover intact and everything hid. I have had them remain quiet and continue suckling their young when I lifted the straw covering to the nest." Mr. Mitchell adds that the young of the Texas swamp rabbit (*Sylvilagus aquaticus*) are also born blind and naked.

Prof. F. E. L. Beal informs me that he has found the nest of *Sylvilagus transitionalis* in Massachusetts and of *S. floridanus mearnsi* in Iowa containing newly born young which were still blind and naked. A set of large embryos of *Sylvilagus nuttalli grangeri*, collected by Vernon Bailey in Wyoming, are without a trace of hair. Bailey made a memorandum at the time of collecting these specimens that they were nearly ready for birth.[a]

DISTRIBUTION OF HARES AND RABBITS IN NORTH AMERICA.

The Leporidæ are practically of world-wide distribution, but are not native to Australia nor to the majority of oceanic islands. The family is divided at present into nine recognizable genera. Of these only one, the circumpolar genus *Lepus*, inhabits parts of both the Old and the New World.

In all the Old World there are now six recognized generic types, two of which, *Lepus* and *Oryctolagus*, are wide ranging. The others, *Pronolagus* (South Africa), *Nesolagus* (Sumatra), *Caprolagus* (Southern Himalaya), and *Pentalagus* (Liu Kiu Islands, off Japan), are widely scattered and comparatively local.

The number and variety of forms of the Leporidæ appear to be greater in North America and fewer in South America than in any of the other continental areas. Of the four genera inhabiting North America, one (*Lepus*) is circumpolar; two (*Brachylagus* and *Romerolagus*) are peculiar to this continent, and the other (*Sylvilagus*) is common to both North and South America. In North America the genus *Lepus* is represented by two subgenera, the typical subgenus *Lepus* of circumpolar distribution and the local subgenus *Macrotolagus*. *Brachylagus* and *Romerolagus* are monotypic genera of local distribution. *Sylvilagus* is divided into two subgenera (common to both North and South America), of which typical *Sylvilagus* reaches its highest development in North America, and *Tapeti*, with the greatest range of all American subgenera of rabbits, extends from the Dismal Swamp of Virginia to northern Patagonia and reaches its greatest development in South America.

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[a] As this paper is passing through the press the National Museum has received a litter of six very young *Sylvilagus floridanus mallurus* collected at Cleveland Park, Washington, D. C., June 6, 1909, by Dr. A. Hrdlicka. They are apparently several days old, but the eyes are closed, the ears are like rounded fleshy pads, and the body is thinly covered with the fine short tips of the starting pelage, through which the skin is apparent. They are very different from young *Lepus* of the same age, and furnish additional evidence that the young of *Sylvilagus* are blind and naked at birth.

The total range of the family in America covers the entire breadth of the continents, and extends from 83° north latitude, in northern Greenland, south to beyond 40° south latitude in northern Patagonia. Its vertical range extends from sea level to above timberline, reaching an elevation of more than 14,000 feet on some of the high mountains of Mexico.

The Leporidæ of North America reach their greatest development in abundance of individuals and in number of specific and subgeneric types on and about the immediate borders of a great elevated interior region, extending in a northerly and southerly direction from the northern United States to central Mexico. (See fig. 1.) In the United States the northern part of this region coincides with the Great Basin area, whose limits may be given roughly as reaching on the east to the Rocky Mountains, on the north to the mountains of central Idaho and the northern border of the Plains of the Columbia, and on the west to the Sierra-Cascade mountain system. From the southern border of the Great Basin it extends southeasterly across the plateaus of Arizona and New Mexico and thence south to include the Tableland of Mexico. In Mexico it is limited on the west by the Sierra Madre; on the east by the Cordillera of the East, and on the south by the southern border of the Valley of Mexico and Plains of Puebla. The Desert Plateau region is about 2,000 miles in length, north and south, and is broadest in the northern half, where it reaches a width of about 800 miles; to the southward it narrows to a blunt point. It is made up mainly of elevated treeless plains averaging from 3,000 to 7,000 feet above sea level in the north, and gradually decreasing to from 3,000 to 5,000 feet near the Mexican boundary, whence it rises gradually southward to 6,000 or 8,000 feet on the Plains of Puebla. Scattered over these irregular plains are numerous more or less isolated mountains and small ranges. The climate throughout most of the area is hot and extremely arid in summer. So scanty and irregular is the rainfall that the vegetation of the plains consists largely of scrubby shrubs and peculiar desert forms of plant life, such as cactuses, yuccas, and agaves. The streams are often bordered with willows and cottonwoods. The tops of the mountains, when sufficiently high, are usually covered with open coniferous forests. The plains within this region lie mainly within the arid upper and lower Sonoran life zones. From its climatic and topographic features this great interior area may be called the American Desert Plateau region.

The rabbit fauna of the Desert Plateau includes representatives of all of the four genera and all but one of the subgenera known to occur in North America. The missing subgenus, *Tapeti*, belongs mainly to tropical America and the southeast coast region of the United States, and is preeminently a forest-loving group. One representative of *Tapeti*, *Sylvilagus gabbi truei*, lives along the seaward slope of the Cordillera forming the east border of the Desert Plateau in Mexico.

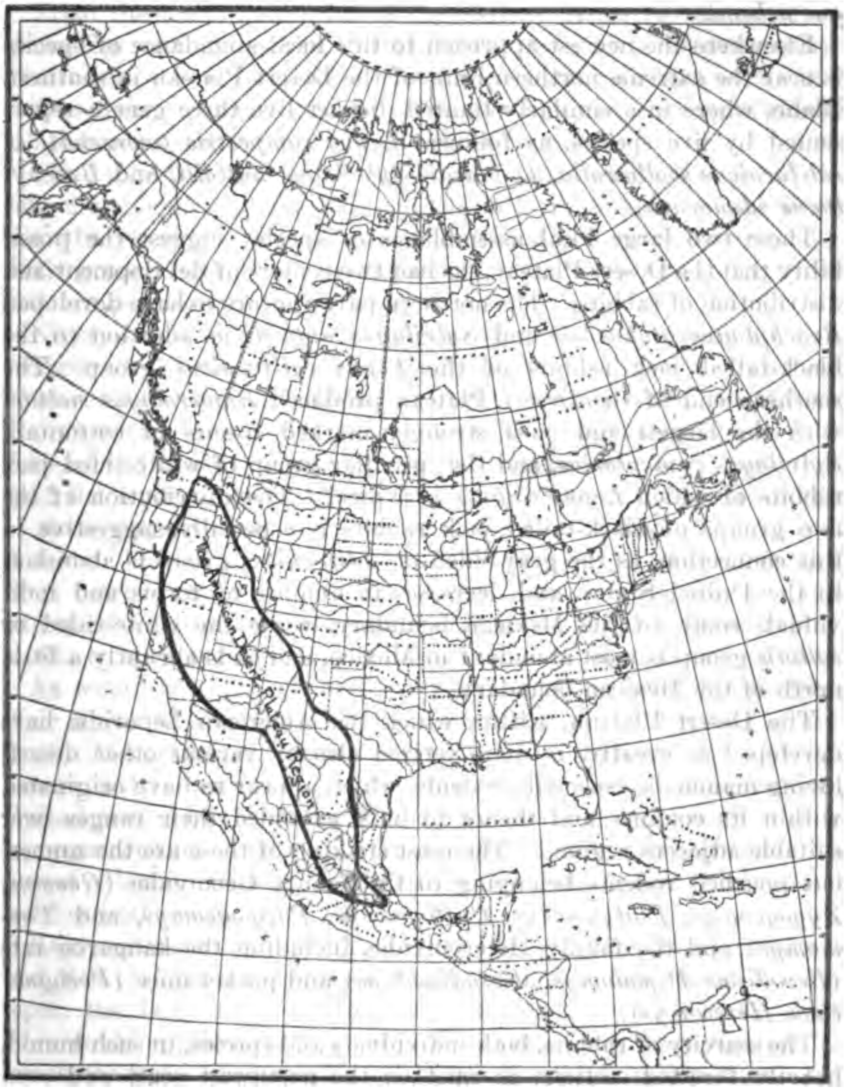

FIG. 1.—Map of the American Desert Plateau region, within which the Leporidæ of America reach their greatest development.

The area richest in hares and rabbits within the American Desert Plateau is near its extreme southern end. Here, within a district

40 miles in diameter, about the eastern border of the Valley of Mexico, live representatives of three genera and six well-marked species, as follows: *Lepus californicus festinus*, *L. callotis*, *Sylvilagus floridanus orizabæ*, *S. auduboni parvulus*, *S. cunicularius*, and *Romerolagus nelsoni*.

Elsewhere the nearest approach to this local abundance of species is near the extreme northern limit of the Desert Plateau in southern Idaho, where in a similarly limited district live three genera represented by five species, as follows: *Lepus campestris townsendi*, *L. californicus wallawalla*, *L. bairdi*, *Sylvilagus nuttalli*, and *Brachylagus idahoensis*.

These two large local assemblages of species suggest the possibility that the Desert Plateau has had two centers of development and distribution of rabbits. The northern part appears to have developed *Brachylagus idahoensis* and *Sylvilagus nuttalli* in addition to the black-tailed jack rabbits of the *Lepus californicus* group. The southern end of the Desert Plateau produced *Romerolagus nelsoni* with the largest and most strongly marked species of cottontail, *Sylvilagus cunicularius*, and the peculiar group of white-sided jack rabbits of which *Lepus callotis* is typical. The distribution of the two groups of black-tailed jack rabbits is especially suggestive in this connection, as the gray-sided or *californicus* group is abundant in the United States, and decreases in number of forms and individuals south of the Mexican boundary, while the white-sided or *callotis* group is most abundant in Mexico, and ends abruptly a little north of the Mexican boundary.

The Desert Plateau, within which the American Leporidæ have developed so greatly, is characterized also by various other desert-loving mammals, especially rodents, which appear to have originated within its confines and thence to have extended their ranges over suitable adjacent regions. The most striking of these are the numerous pouched rodents belonging to the family Geomyidæ (*Geomys*, *Zygogeomys*, *Platygeomys*, *Cratogeomys*, *Pappogeomys*, and *Thomomys*) and the family Heteromyidæ, including the kangaroo rats (*Perodipus*, *Dipodomys*, *Microdipodops*) and pocket mice (*Perognathus*, *Heteromys*).

The scarcity of rabbits, both individuals and species, in such humid, heavily forested sections as exist on the northwest coast and even in the wooded eastern third of the United States is in strong contrast to their abundance on the arid plains of the Desert Plateau.

The vertical range of rabbits appears to be governed only by the presence or absence of sufficient vegetation for food and shelter, and extends from the tropical coast to above timberline, sometimes on the lofty volcanoes of Mexico reaching an altitude of over 14,000 feet. This great difference of altitude is covered in Mexico by the combined ranges of two geographic races of the most widely distributed cottontail rabbit, *Sylvilagus floridanus*. One of these, *S. f. connectens*, occupies the tropical coast region and lower slopes of Mount Orizaba; the other, *S. f. orizabæ*, ranges thence to above timberline.

From the northern border of the United States to the arctic regions live various members of the subgenus *Lepus*. The northernmost of these is a group of species occupying the desolate arctic barrens and known as arctic hares, which form part of a group of closely related species having a circumpolar distribution.

The other two groups of species in the American section of the subgenus *Lepus* are the white-tailed jack rabbits (*L. campestris*) and the varying hares belonging to the *Lepus americanus* group. Both groups inhabit a more southerly range than the arctic hares, and are peculiar to North America.

Ninety-seven species and subspecies of hares and rabbits are here recognized as living within the limits of North America. Of these, 48 have their ranges wholly north of the northern border of Mexico, 34 live wholly south of that line, while 14 occupy territory on both sides of the border. Fifty-four species and subspecies, or more than half the entire number known in North America, have all or part of their ranges within the borders of the United States exclusive of Alaska. *Sylvilagus floridanus chiapensis* reaches Nicaragua and *S. f. aztecus* ranges to northern Costa Rica, but *Sylvilagus gabbi* and its two subspecies, *truei* and *incitatus*, are the best known rabbits in the country between the southern border of Mexico and Panama.

As would be expected, various types of rabbits have spread from their center of abundance on the Desert Plateau, easterly across the Rocky Mountains and over the Great Plains, and westerly through passes in the mountains to the Pacific. In the extreme southern United States and northern Mexico the continent narrows and is so homogeneous in climate and other physical characteristics that the Desert Plateau subgenus, *Macrotolagus*, ranges entirely across and touches both coasts.

Representatives of only two Desert Plateau subgenera, *Sylvilagus* and *Macrotolagus*, extend their ranges beyond the Isthmus of Tehuantepec, the last named passing the isthmus only a short distance. This would appear to indicate that the isthmus once formed a barrier which these rabbits have crossed in comparatively recent time. On the other hand, the tropical American subgenus, *Tapeti* (including the swamp rabbits of the southeastern United States), which is widely represented by many species in South America, appears to be intrusive north of the Isthmus of Tehuantepec.

Tapeti, like all other peculiarly American rabbits, undoubtedly originated in North America north of the Isthmus of Tehuantepec. This probability is strongly supported by the close relationship between the subgenera *Tapeti* and *Sylvilagus*. In fact *Tapeti* appears like an offshoot from the same ancestry as the subgenus *Sylvilagus*, developed by isolation in the Tropics. The ancestors of *Tapeti* must have ranged from the north to beyond the Isthmus of Tehuantepec and have been isolated in Central and South America sufficiently long for the development of the present subgeneric characters. Afterwards, because of changed physical conditions, the barrier at the isthmus was removed, and the intrusive movement of *Tapeti* to the north began. The subgenus worked along the eastern coastal region as far as the southeastern United States, after which a change of climatic conditions in the coast region of southern Texas and northeastern Mexico caused a break in the continuity of the range of *Tapeti* whereby the ancestors of the swamp rabbits of the United States were isolated from their close relatives, the wood rabbits of the tropical forests in eastern Mexico.

CHANGES IN DISTRIBUTION.

Changes in the distribution of a number of American hares and rabbits appear to be taking place continually. Some of these are temporary, as when through disease certain districts are depopulated, only to be reoccupied a few years later. But the main and most permanent changes of distribution are caused by man. The extension of the farming area in the United States and Canada, deforestation of the country, and destruction of many of the natural enemies of cottontails, such as birds and beasts of prey, has resulted in considerable permanent extensions of the ranges of several species. It is altogether probable that previous to the settlement of the country and its deforestation cottontails were unknown in a large part of the eastern United States. Of some extensions of their ranges we have definite records. Mr. J. H. Fleming writes that the cottontail (*S. f. mearnsi*) is not considered to have been indigenous in any part of Ontario, Canada. It was first recorded at Niagara in 1871, and since then has spread gradually northward. In January, 1908, Fleming reported it from the south shore of Lake Simcoe, Ontario, and from well along the Canadian shores of Lakes Huron and Ontario, and Gerrit S. Miller, jr., records its eastward extension from Geneva to Peterboro, in central New York, subsequent to 1870.

Within an even more recent period Dr. A. K. Fisher has noted the extension of *S. transitionalis* northward to the shore of Lake George, where it was numerous in the fall of 1907.

Vernon Bailey informs me that within the last ten or twelve years *Lepus campestris* has followed the extension of farms in central Minnesota and moved eastward across the Mississippi from its former range on the prairies for 50 or 60 miles to Elk River. In the early eighties the cottontail (*S. f. mearnsi*) in this same region extended its range north from near Minneapolis, and now has occupied the country to a point well north of Elk River, in Minnesota, and to Gordon, in northwestern Wisconsin.

A progressive restriction of the area occupied by varying hares appears to be taking place all along the southern border of their range. This is largely due to deforestation, and is accompanied by an equally steady coextensive northward extension of the range of the cottontails.

In the southern half of New York and the New England States varying hares have nearly or quite disappeared from many localities where they were formerly numerous. They were once abundant in the forested parts of the Canadian and transition zones in Pennsylvania and New Jersey, but are now nearly gone in the latter State, and remain only in many isolated areas in the Allegheny and Blue Ridge mountains of Pennsylvania. Farther south their range in the mountains of Virginia and West Virginia is becoming similarly restricted. The lessening range of this hare is accompanied by the increasing range of the cottontails, *Sylvilagus f. mallurus*, *S. f. mearnsi*, and *S. transitionalis*.

In addition to self-operating changes in the distribution of these animals, man has interfered directly in a few cases, and has introduced species where they were not native. The introduction of varying hares in Newfoundland and of varying hares and cottontails on Nantucket Island may be cited as examples.

HABITS.

The habits of the American cottontails and jack rabbits in the well-populated parts of the United States are fairly well known and are generally considered typical of the rabbit family as a whole. This belief holds true for a majority of the species, but among the others are some interesting, and in a few cases extraordinary, differences in habits. Much, however, yet remains to be learned of the life histories even of the best-known species. Practically all the species are mainly crepuscular or nocturnal, although some of them, especially the jack rabbits, often move about by day, particularly in cloudy weather. When hares or rabbits become very abundant and food is scarce, they are often forced to become more diurnal than under usual conditions. All the species of *Lepus* make nest-like 'forms' in sheltered spots, in which they conceal themselves during the day; although in summer *Lepus campestris* sometimes uses the deserted holes of other mammals, and in winter burrows into the snow for protection from the bitter cold, and from the birds and beasts of prey on the open plains where it lives.

Most members of the genus *Sylvilagus* use both forms and the deserted burrows of other mammals, or find shelter under rocks, roots of trees, and similar places. Forms are in common use in summer and in regions which have a warm winter climate, but some species habitually use old burrows, which they sometimes enlarge. The forms are usually made under the shelter of dense herbage or under low brushy growths, and the owner spends the day in them regularly for considerable periods. The females of many, if not all, species of *Sylvilagus* make soft, warm nests of fine grass, leaves, and other vegetable material, lined with hair from their own bodies, and in these nests the young are born and lie concealed, like mice in a nest, while small and helpless. The nests of cottontails are usually placed in a bowl-shaped depression in the ground in some sheltered spot, and during the absence of the parent the young are covered and completely concealed by the material of the nest. At such times the top of the nest is so like the surrounding surface of the ground, on which lie dead leaves and grasses, that its presence can be detected only by chance. Various subspecies of *Sylvilagus auduboni*, a group living mainly on more or less open plains of the arid regions, commonly need more secure shelter than is afforded by a form in the scanty herbage of their home and, more frequently than the subspecies of *floridanus*, they occupy the deserted burrows of other mammals or the secure refuge of holes under rocks, or crevices among stone walls and in rocky ledges. They even take possession of the space under floors of outbuildings about ranches, and I have found families of six or eight living under deserted ranch houses. In some cases they enlarge burrows or dig the dirt from between rocks or under boards to make an entrance under a house, but appear never to make entirely new burrows.

Brachylagus idahoensis is the only American species known habitually to make its own burrows in the ground. Vernon Bailey has discovered that, while it frequently makes use of deserted badger holes, it commonly digs burrows, which are often connected on the surface by well-marked runways.

Romerolagus nelsoni makes its own runways, and tunnels among dense masses of coarse grass; in fact, it has many of the habits of a giant field mouse (*Microtus*). The tropical representatives of *Tapeti* within our limits live in dense undergrowth and make runways through the thickets. The swamp rabbits of the same subgenus live in the wooded lowlands of the southeastern United States, and are remarkable for liking wet situations. Their habits are semiaquatic, and they swim with the greatest freedom. Bachman's interesting account of *Sylvilagus palustris* gives a good idea of the strange habits of species of this group, which are very different from those of any other American rabbits.[a] This author states that *S. palustris* makes a domed nest for its young with an entrance on one side.

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[a] Quadrupeds of North America, I, pp. 152–155, 1849.

DISEASES.

In the Western United States and Canada rabbits, including jack rabbits, varying hares, and cottontails, periodically become excessively abundant. Then a fatal disease breaks out, apparently an epidemic, and within two years or so they almost totally disappear from vast areas. The exact nature of these epidemics remains to be determined. MacFarlane speaks of a disease occurring each decade among the varying hares in northern Canada, and states that it "affects the head and throat of the victims." In the upper Mackenzie River region during the winter of 1904 E. A. Preble found varying hares extremely numerous, and great numbers were dying from an epidemic. His examinations showed that the throats and lungs of the diseased animals were much inflamed, the viscera excessively moist, and their flesh and skin very dry. The epidemic witnessed by Preble continued the following year or two and extended over a large part of Canada, even reaching to the Magdalen Islands, off the east coast. Before the disease reached these islands varying hares were extremely abundant; but in the summer of 1907 W. H. Osgood spent a large part of his time for a week, aided by native hunters, trying to secure there specimens of these animals, without even seeing fresh signs of one. This case is typical of the conditions which usually prevail over the range of a species which, after a period of great abundance, has suffered from one of these deadly epidemics. There is a general belief in the areas where these epidemics occur that they recur with some regularity. According to Bendire the people of southern Idaho thought they occurred among the jack rabbits every five or six years. In the Mackenzie region Preble learned that the residents believe they recur about every seven years.

Mr. A. G. Maddren reports that during the winter of 1906–7 most of the varying hares died in the Copper River region, Alaska. During the summer of 1907 he saw quantities of white fur in patches wherever he went in this region, the fur being often lodged in the bushes at the level of the winter snow, showing that the animals had died in midwinter. During the summer of 1908 these hares were extremely scarce along the entire course of the Innoko River, thus showing that the same epidemic that killed them in the Copper River country had extended across into the lower Yukon Valley. During the winter and spring of 1908 Mr. Charles Sheldon noted the extreme scarcity of varying hares at the north base of Mount McKinley and in the Tanana River Valley.

Jack rabbits, especially in California, often have under the skin of the body large, watery, tumor-like gatherings which contain the larvæ of a tapeworm (*Taenia serialis*). The skin of jack rabbits, and less commonly of cottontails, is sometimes infested with the larvæ of a fly. These grubs are known as 'warbles.' A more curious but less serious disease is most common among cottontails west of the Mississippi River. This is the growth of long, conical, horn-like excrescences on the skin, usually on the head, which appear to have a close similarity to warts and not to affect the general health of the victim. These excrescences vary in number from one to half a dozen and are an inch or two in length. They stand out at right angles from the skin and look like little horns. Sometimes they grow symmetrically on the top and sides of the head, giving the animal a remarkable appearance.

INCREASE AFTER EPIDEMICS.

From Preble's observations among the varying hares, the number of young in a litter is reduced during the periods of epidemic. MacFarlane says: "A litter usually consists of three or four; but when on the 'periodic' increase [after an epidemic] females have been known to have as many as six, eight, and even ten at a time, and then gradually return to three or four." This increased birthrate helps to account for the extraordinary rapidity with which ranges are restocked with rabbits after epidemics; for comparatively few are left alive within the depopulated areas.

DISTRIBUTION OF COLOR.

The typical color pattern of American rabbits consists of a nearly uniform grayish or buffy brownish shade over the upperparts of the head and body; a broad band of similar, but usually clearer, color across the underside of the neck; uniform white or whitish over all or most of the remainder of the lowerparts, and a patch of unmixed gray, buffy, black, or rusty on the nape.

In summer pelage the prairie hare (*Lepus campestris*) and the varying hares, and in ordinary pelage *Brachylagus* and *Romerolagus*, have the back and sides of a nearly uniform color. When the sides of any of the foregoing species are slightly paler than the middle of the back, the difference is due to the greater abundance of black hairs on the back. On the other hand, most of the cottontails (genus *Sylvilagus*) and most of the subspecies of *Lepus californicus* (the common jack rabbits of the western United States) have the sides distinctly paler than the top of the back, and the rump usually paler than the rest of the back, sometimes enough so to make a distinct grayish rump patch in strong contrast to the darker back. In fresh pelage there is often a long oval darker area which covers the top of the back from the front of the shoulders to the rump, and is outlined below by a paler grayish or pale buffy wash on the surface of the sides and rump. This dark area may be called the mantle. Close examination often shows that the contrast of surface shades which distinguishes the dark mantle from the pale areas on the rump and sides extends also in a less degree to the colors of the underfur, so that the contrasting areas are still apparent when the outer hairs wear away and expose the underfur. The same pattern—a dark mantle covering the top of the back and outlined by pale sides and rump—is well marked in the winter pelage of *Lepus campestris* along the southern border of its range (Kansas and Colorado), where it does not become entirely white. The real significance of the pale sides and rump contrasting with a dark dorsal area is strikingly shown in the *Lepus callotis*, or white-sided group of jack rabbits, which includes *Lepus callotis*, *L. flavigularis*, *L. altamiræ*, *L. gaillardi*, and *L. alleni*, with the subspecies of the two last named. This group of species is characterized by a dark buffy mantle covering the top of the back and sharply outlined by whitish or iron-gray sides and rump, the white or pale gray of the sides being continuous with the white on the abdomen. That the striking color pattern of these species is a form of directive coloration, as in the case of the white rump patch of the prong-horn antelope, is proved by observations made by Goldman and myself in Mexico. We have started numerous individuals of *L. callotis*, *L. flavigularis*, and *L. alleni* from their forms, and seen them move off in short zigzag courses, and at each turn the dark mantle was shifted to the opposite side and the whitish area of the side drawn up nearly or quite to the dorsal line, thus presenting to our view an entirely whitish side, which flashed out brilliantly in the sunlight. At a distance, during this performance, the jack rabbits appeared to be almost entirely white. A more detailed account of this habit is given in the preliminary notes to the descriptions of the members of this group (p. 115). It may be added here that these species, like the antelope, commonly live on open plains. The frontispiece illustrates the manner in which the dark mantle is drawn over and the white area enlarged.

The discovery that there is a group of jack rabbits in which the color pattern is used for a definite purpose raises an interesting question concerning the significance of the traces of this same pattern in other species, both of *Lepus* and of *Sylvilagus*. Are they instances of parallel development toward the same white-sided pattern as that of *callotis*, or are these species losing a pattern which, once common to all, is now fully retained only by the white-sided jack rabbits of the southwestern United States and Mexico? The theory of parallel development appears to fit the case most reasonably.

The distribution of color on the majority of American rabbits living in temperate and hot climates—darkest on top of the back, paler on the sides, and white on the underside of the body—conforms to the color scheme best adapted to protective purposes as demonstrated in his study of birds and mammals by Abbott H. Thayer. The arctic hares in gray summer pelage reverse this distribution of color and have the top of the back lighter than the sides and the dusky color on the sides increasing in intensity downward, thus becoming darkest along the lower flanks next to the pale abdomen.

All of the members of the subgenus *Macrotolagus*, which includes the white-sided as well as the gray-sided, or *californicus*, group of jack rabbits, have a distinct black line along the middle of the lower rump and upperside of the tail. The arctic hares, and the prairie hare in most of its range, have the top of the tail pure white. *Lepus campestris townsendi*, however, commonly has more or less dusky or black on the upperside of the tail. This character is most strongly marked in specimens from southwestern Colorado. One individual from Coventry, Colorado, has a broad black line on the tail about as strongly marked as in *Lepus c. texianus*. Here appears to be another instance of parallel development in an area where two distinct species are subjected to the same conditions. The upperparts of the cottontails are usually a mixture of gray, buffy, and dusky, producing a neutral shade very effective for purposes of concealment. The result of environment on these dull colors has been to bring about close resemblance or parallelism between races of distinct species occupying the same or closely adjacent territory. For instance, specimens of *Sylvilagus auduboni warreni* and *S. nuttalli pinetis* are often practically indistinguishable in color. The same close resemblance appears between specimens of *S. auduboni baileyi* from the east base of the Rocky Mountains in Colorado and specimens of *S. floridanus similis* from the same region. Other cases of the same kind exist, and show that like climatic conditions often produce the same or closely similar colors in dissimilar species of rabbits.

MELANISM AND ALBINISM.

Both melanism and albinism are extremely rare among American rabbits. I have seen two melanistic specimens, one of *Sylvilagus palustris paludicola* and one of *Lepus americanus virginianus*, and two albinistic individuals, one of *Sylvilagus floridanus mallurus* and one of *S. transitionalis*.

DICHROMATISM.

Among the darker colored hares and cottontails it is difficult to find evidence of dichromatism, but among some of the paler forms it is distinct. It is most evident among the paler subspecies of *Lepus californicus* and *Sylvilagus auduboni*. *Lepus c. deserticola* and *L. c. texianus*, and also *Sylvilagus a. arizonæ* and *S. a. minor*, are characterized by the generally pale gray color of their upperparts, but occasional individuals occur sporadically throughout the ranges of these forms which are strongly buffy or even ochraceous buffy. These individuals are often indistinguishable in color from another subspecies occupying a different area. The converse of this condition, an occasional pale individual in the range of dark forms, appears to be less common, though it sometimes occurs.

CHARACTER OF PELAGE.

The pelage of rabbits, as of other mammals, varies in length and density according to the severity or mildness of the climate. This is well illustrated in the remarkable contrast between the long, dense, woolly coat of *Lepus grœnlandicus* in the far North, and the short, thin, and rather coarse coat of *L. flavigularis* from the tropical coast of southern Mexico. Similar differences in smaller degree exist between species of warm lowlands and those of adjacent cool elevated mountain slopes.

The color of rabbits responds readily to climatic influences. This is most strikingly shown by the two annual molts of the northern species, which become white in winter and dark in summer. In north Greenland, however, where areas of perpetual snow are more or less abundant, *Lepus grœnlandicus* remains white throughout the year. In Kansas and parts of Colorado *Lepus campestris* changes into a winter coat only a little paler than the summer pelage, although farther north, where the snow is more abundant and lies longer, it becomes entirely white. Species of the arid regions are light colored and become paler or grayer with increase of aridity, while those of humid regions are darker with deeper shades of buffy and rusty. Specimens from some localities appear to indicate a small but appreciable difference in the general shade of the upperparts in the same locality due to marked temporary variations, such as a wet or dry summer or an open or snowy winter.

The pelage is heaviest on the top of the back and thinnest on the abdomen. It is made up of three sets of hairs, which are most strongly differentiated on top of the back and may be characterized as follows: (1) A fine, short, and dense underfur; (2) a longer, thinner and coarser coat of hairs, the tips of which overlie and conceal the underfur; and (3) a still longer, coarser, and more sparsely distributed set of hairs, the tips of which overlie the shorter middle coat. The underfur is usually buffy or gray, with a strongly contrasting darker tip; the middle coat of hairs usually has a dusky tip with a broader subterminal zone of buffy or grayish; and the coarse longer hairs, most abundant along the middle of the back, are usually glossy black, at least on their terminal half. These long black hairs overlie all the rest of the pelage, and often give the effect of a strong blackish wash over the back. The full growth of the long black hairs characterizes the adult pelage, but they vary in length and abundance even in geographic races of the same species. The absence or slight development of the black hairs in the juvenal and postjuvenal pelages is largely the cause of the paler color of the upperparts in these pelages in comparison with the adult condition. All the arctic and other northern hares in winter pelage are more or less exceptions to this color distribution. They become pure white externally, and the arctic hares are entirely white, including the underfur. The varying hares and white-tailed jack rabbits, however, always have the underfur bicolored, though paler in winter than in summer.

DIFFERENCES IN PELAGE DUE TO AGE.

Three distinct pelages due to age appear to be common to all American hares and rabbits. These may be characterized as follows:

1. *Juvenal pelage.*—This is soft and woolly and may be compared to the downy plumage of young birds. It is perhaps of somewhat longer duration than the downy plumage, but usually gives way, when the animal is less than half grown, to the postjuvenal or second pelage.

2. *Postjuvenal pelage.*—The term postjuvenal applied to the plumage of birds following the juvenal state is exactly applicable to a similar condition existing in the Leporidæ. This is characterized by a much greater development of the middle, or hairy coat, overlying the underfur than in the juvenal condition. The overlying coat is composed of finer hairs than in the adult, and usually averages paler, with a more finely grizzled, or 'salt and pepper,' appearance. This paler color is due mainly to the absence of the long black hairs of the adult and to the reduced amount of dusky on the tips of the middle coat, which results in a fine mixture of the dusky with the ground color, instead of, as in adults, an overlying black wash. There is a general resemblance to the adults in the postjuvenal condition, but the absence of the coarsening, as well as darkening, effect of the long black hairs on the back, as well as the paler and more finely grizzled colors, usually render individuals in this pelage readily separable from adults.

The postjuvenal pelage is usually retained until the animal is nearly full grown, when it gives way to the adult stage. Occasional breaks appear to occur in the sequence of the three pelages, and individuals not much more than half grown appear to assume the adult pelage. This break is only apparent, however, and is due to marked individual acceleration of the pelages by which the postjuvenal stage is much shortened. This may indicate evolution toward the eventual suppression of this pelage, leaving merely the juvenal and adult.

3. *Adult pelage.*—This is the final condition which replaces the postjuvenal pelage as the individual approaches maturity. It is characterized by the coarser hairs of the middle coat with darker and more coarsely grizzled colors, and by marked development of the long black hairs which overlie the back.

The postjuvenal pelage of American rabbits appears not to have been recognized by previous authors, and has resulted in misunderstanding regarding certain species. The element of individual variation, actually great, has been made to appear even greater by specimens in postjuvenal condition. The contrast between individuals in postjuvenal and adult pelage is greatest in those species or subspecies in which adults have the heaviest growth of long black hairs overlying the surface of the back. In forms in which the black hairs are least conspicuous in adults the postjuvenal and adult pelages are much more alike, and are distinguishable mainly by the distinctly finer or more 'pepper and salt' character of the grizzling on the upper parts, coupled with the generally slightly paler colors of the young.

MOLTS AND OTHER SEASONAL CHANGES IN PELAGE.

By peculiarities of molting, American rabbits are separable into two classes: (1) Those which have two annual molts, and (2) those which have only one annual molt. All American species of the genus *Lepus* (except the subgenus *Macrotolagus*) and the genus *Brachylagus* belong in the first category, while all of the genus *Sylvilagus*, the subgenus *Macrotolagus* of the genus *Lepus*, and probably *Romerolagus* belong in the second class.

SPECIES HAVING TWO ANNUAL MOLTS.

The species belonging to the northern subgenus *Lepus* and the genus *Brachylagus* have two annual molts, which occur in spring and fall. These molts result in distinct and usually strongly contrasted summer and winter pelages. While in most species these summer and winter pelages are very unlike, there are a few exceptions. *Lepus grœnlandicus* throughout its range, and *Lepus arcticus* in the northern part of its range, are white throughout the year, though the white summer pelage of both is duller and scantier than the winter pelage. *L. campestris* is dull buffy yellowish in summer, and in the northern part of its range, white in winter; while on the southern border of its range, in Kansas and Colorado, the winter pelage is nearly as dark as that of summer. *L. washingtoni* of the subgenus *Lepus* is the only known American member of this subgenus which has practically the same brown color in winter as in summer. The other members of this subgenus are brown in summer and white in winter, though the underfur remains bicolored throughout the year, but is paler in winter. *Brachylagus* is grizzled buffy brown in summer, with a general resemblance in color to various forms of *Sylvilagus*. The type and topotype of *B. idahoensis*, collected in September, have an abundant silky-haired pelage of a nearly uniform pinkish drab, different from any other American species at this season; some freshly molted fall specimens of *Sylvilagus a. baileyi* from Wyoming, however, have considerable resemblance in general color to this pelage of *idahoensis*.

The change in color from the white winter pelage of northern species to the dark summer coat, or vice versa, is accomplished so gradually that at certain stages it appears like a change in the color of the hairs instead of a molt. Examination of abundant material confirms the fact of a complete molt, as was definitely proved some years ago by Doctor Allen in his paper on the changes of pelage of the varying hare.[a]

The molts usually begin about the head and feet and proceed more or less irregularly over the body, but there is no absolute rule, and patches of new pelage may appear on any part of the body, especially if the old coat has been thinned by abrasion or other local cause.

In spring, just before the molt, the long white surface coat of the varying hares often wears away more or less completely, and leaves the buffy or dusky underfur exposed, thus producing a striking change in color without a molt. Late in summer, preceding the fall molt, there is often a similar wearing away of the outer coat, thus leaving the woolly underfur exposed and again changing the general shade of the upperparts.

Adults of *Lepus bairdi* and extreme northern representatives of *Lepus americanus* appear to have white feet throughout the summer. The young of these white-footed animals have dark colored or brownish feet through the juvenal and postjuvenal pelages. Adults of *washingtoni* and the southern subspecies of *americanus* have dark colored or mixed white and brown feet in summer.

Effect of seasonal differences on time of molt.—The time of the spring and fall molt of the subspecies of *Lepus americanus* varies with the character of the season. An early spring or fall brings on the molt a month or more earlier than a late one. A good illustration of the influence of season on molt was afforded by *L. a. struthopus* in Nova Scotia during the mild late fall of 1907. Several specimens from Kings County collected as late as November 25 were just beginning to assume the white winter coat, and others from the same place collected on December 6 and 7 were not yet in full winter pelage, though ordinarily pure white at this time.

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[a] Bull. Am. Mus. Nat. Hist., VI, pp. 107–128, May 7, 1894.

Decrease of amount of white in winter pelage of L. americanus southward.—Among the subspecies of *L. americanus* there is much difference in the thickness on the back of the overlying white winter coat. The northern forms have a thick, heavy layer of white completely concealing the buffy surface of the underfur. In the southernmost forms, including *virginianus*, *struthopus*, and *phæonotus*, the overlying coat of white is so thin that the buffy underfur often slightly tinges the generally white shade and distinctly shows through wherever the white surface hairs are even slightly disarranged, while the ears, head, and tops of feet often have more or less rusty buffy on the surface. Winter specimens from Newfoundland, like Nova Scotia specimens, have a very thin layer of white on the surface of the back, with the buffy underfur showing through, in strong contrast with the much purer white specimens from the neighboring coast of Labrador.

SPECIES HAVING ONE ANNUAL MOLT.

Adults of the southern groups of rabbits, including the genus *Sylvilagus*, the subgenus *Macrotolagus* of the genus *Lepus* (and probably the genus *Romerolagus*), appear to have but one molt annually. In the great majority of the forms this occurs the latter part of summer or in fall, generally between the middle of August and the middle of October; but in a few subspecies the change often begins in June or July. The ordinary exceptions to this rule in adults are the occasional individuals which through malnutrition or illness have had the regular course of life processes disarranged. Such individuals are likely to retain the old pelage longer than usual and to molt at unseasonable times. Occcasional individuals molt very early in summer. In addition, every large collection contains specimens, especially from mild southern climates, which have taken on fresh pelage at odd times of the year. Examination of the skulls usually proves that these are young animals assuming their postjuvenal or first adult pelage in the regular sequence. Such cases have no bearing on the regular molt of adults.

The fresh fall or winter pelage is much darker and richer than that of any other period; the long overlying black hairs are most conspicuous at this time, and in some forms produce a thin dark shading to the upperparts and in others a heavy black wash.

There is a progressive wear and fading of the pelage from its assumption until the molt the following year. In the more humid regions, with less sunshine and with an abundance of sheltering vegetation, the colors fade more slowly, and the rabbits rarely present the ragged and scorched appearance common in arid regions. The species of the humid areas are darker in color, and usually have more buffy or buffy brown in the upperparts, which, when the pelage is worn and faded, often changes to a distinctly more rusty or rusty reddish shade.

In fresh pelage the tips of the hairs on the rufous areas of the nape and legs are paler than the underlying color, and thus dilute or dull the intensity of the rufous. The wearing away of these pale tips gives the rufous areas a deeper or more intense color in worn spring specimens than in those in fresh fall pelage. As the general color of the upperparts in spring is paler than in fall and the rufous leg patches brighter, the variation in the amount of contrast between these color areas in the same subspecies at different seasons is often marked.

In dry regions of abundant sunshine and sparse vegetation the colors of the fresh pelage begin to fade immediately after the molt and soon show an appreciable loss of intensity. The fading of the general colors is accompanied by the wearing away of the long black hairs overlying the fur. This fading and wear continue steadily throughout the year until the next molt. By spring the colors have become so much paler that frequently specimens representing the two seasons are very unlike. Sometimes the long hairs are entirely worn away, and the exposed underfur is so worn that the pelage presents a ragged woolly appearance. The bleaching of the tips of the middle coat and of the long black hairs before they wear away sometimes produces a dull rusty shade over the upperparts not present at any other time. In some individuals the buffy tips of the underfur are heavily underlaid by a zone of darker color. In these instances the wearing down of the pelage causes the upperparts to become even darker, or more dusky, than when freshly molted.

SEXUAL VARIATION.

The only difference in American rabbits due to sex appears to be in size. Very old females of both cottontails and jack rabbits are a little larger than males of the same age. This difference is so slight among average individuals, however, that in identifying specimens it may be ignored.

INDIVIDUAL VARIATION.

The shade of color, size, length of ears, hind feet, and form and proportions of the skull are subject to marked individual variation.

The intensity of the shade of buffy forming the general ground color of the body in so many species is subject to much individual variation, aside from seasonal changes. Among specimens in fresh pelage shot at the same locality on the same day the shade on the back may vary from pale buffy grayish to nearly ochraceous buffy. The sum of the seasonal and individual variations is so great that a large number of specimens in every considerable series, if considered by themselves, are extremely puzzling.

SKULL CHARACTERS AND VARIATION.

The skulls of rabbits change greatly while passing from the young adult to old adult condition. This is due partly to increase of size, but mainly to increased ossification of the parts and consequent increase of weight or massiveness of structure. In many forms the rostrum, rather narrow and slender in the young adult, becomes strong and heavy. The supraorbitals, at first thin and slender, so that the interorbital width is narrow, with increased age become broad and heavy. The anteorbital and postorbital processes, at first of slender form with free ends inclosing well-marked notches, broaden and lengthen until the ends often touch the skull and inclose foramina, or even shut in and coalesce with the skull along their inner borders. All the parts become more massive with this increased ossification, until in some very old examples the character of the skull is so unlike that of typical specimens as to be scarcely recognizable.

The accompanying illustration (Pl. II) of three skulls of adult *Lepus americanus virginianus* from Gold, Pennsylvania, indicates the range of individual variation appearing in nearly all species when large series are available.

Notwithstanding these wide extremes of variation, each species or subspecies usually has certain average skull characters peculiar to it. In some cases these are slightly and in others strongly marked. The skull characters of rabbits, which are most marked, and which serve best for comparison and characterization, are the size of the bullæ; the size, form, and relative position of the supraorbital processes; and the size and form of the rostrum and braincase.

The fairly well-marked skull characters which distinguish some subgeneric, or even generic, groups are sometimes almost completely bridged over by what appear to be cases of parallel development. A good example is *Sylvilagus* (*Sylvilagus*) *f. yucatanicus*, which has a massive skull, with the anteorbital and postorbital processes fused to the frontals along their entire length, and closely resembles in form and general appearance the skull of *Sylvilagus* (*Tapeti*) *aquaticus*. Skulls of *S. transitionalis* and *S. f. mallurus* in overlapping territory of the two species from southeastern New York to the mountains of North Carolina, while remaining unmistakably distinct, approach one another closely in certain characters. An equally close resemblance is shown between a skull of *Lepus washingtoni klamathensis* and typical skulls of *Sylvilagus bachmani ubericolor*, and also between some skulls of *L. campestris* and *L. californicus melanotis* from central Kansas.

The most interesting and instructive point in connection with this parallel development of skulls is that the striking resemblances noted usually appear in individuals inhabiting the same region or neighboring regions, where they are under the influence of the same or closely similar climatic conditions. For example, the range of *Lepus w. klamathensis* is close to that of *S. b. ubericolor* in Oregon, though in a different life zone; and, as just cited, the similarity between *L. campestris* and *L. californicus melanotis* in Kansas is confined to individuals from areas where both species occupy the same territory. *Sylvilagus f. yucatanicus* lives in dense low brush and forest growth in a region bordering the Gulf of Mexico and having an extremely warm, humid summer climate much like that in which *S. aquaticus* has its home. In this last case similarity of skull characters in dissimilar species occurs in widely separated areas, although the home of *S. aquaticus* is shared by another subspecies of *floridanus* in which these parallel characters do not appear.

GEOGRAPHIC VARIATION.

The main differences within specific limits are due, as would be expected, to changes of environment, and result in the production of geographic races. The amount of difference from this cause varies among species of the same genus or even the same subgenus. The geographic races of some species are not strongly marked, as in the case of the subspecies of the California brush rabbit, among which the variation of size, proportions, and color is comparatively small. In the subgenus *Sylvilagus* the extremes of differentiation among the subspecies of *S. auduboni* are less than among the forms of *S. floridanus*, although typical *S. auduboni* and *S. auduboni baileyi* are very unlike. This difference, however, scarcely equals the contrast between the small gray *S. floridanus chapmani* and the large rusty *S. f. yucatanicus*. Among the subspecies of *Lepus californicus* the differences are even more striking. At first glance it seems almost impossible that typical *L. californicus*, *L. c. merriami*, and *L. c. melanotis* can be conspecific. In fact, these three forms were considered by me as specifically distinct until abundant material proved conclusively that intergradation is complete.

INSTABILITY OF CHARACTERS DUE TO GEOGRAPHIC VARIATION.

While studying series of specimens from all parts of the vast range occupied by the geographic races of such species as *Sylvilagus floridanus* and *S. auduboni*, I have been impressed with evidences of fluctuation of both external and skull characters. These fluctuations are somewhat wavelike in character and rise to central points of extreme development and then sink away to intermediate borders beyond which new waves rise. When the waves of differentiation are pronounced they mark recognizable geographic races. Within the area covered by the larger or geographically broader waves of differentiation (recognized as of subspecific value), smaller waves of differentiation are included, which may represent local variations in intensity of characters of the subspecies, or these characters may diminish and the variation tend in other directions, sometimes even closely reproducing the characters of another subspecies occupying a distinct area.

In the case of wide-ranging subspecies such fluctuations are frequent, especially where the areas occupied are diversified by mountains. These fluctuations, which are sometimes extremely local, mark, of course, potential subspecies. Some are fairly well characterized and eventually may be named, while others are too slight to be formally recognized by name but well serve to illustrate the plastic condition of the species. The transition from one subspecies to another takes place abruptly or gradually in exact accord with the changes of environment which produce them. When specimens represent such endless geographic variation it is often difficult to decide whether to retain certain forms already named or to drop them into the wastebasket of synonymy. The difficulties of decision are often increased by the fact that many geographic races have been named from imperfect material, and the types not infrequently prove to have been taken from zones intermediate between the ranges of well-marked forms. Hence the type is not typical and represents the intermediates. In such cases the most strongly marked representatives of the form in question occur only at a distance from the type locality. In many instances, too, the type, though from a locality well chosen geographically to represent the form, proves unlike the average, and not infrequently can not be duplicated in a large series of topotypes.

PERSISTENCE OF GENERAL CHARACTERS UNDER SIMILAR CLIMATIC CONDITIONS.

The periodic destruction by disease of nearly all the rabbits over wide areas leaves but few individuals each time to continue the stock and repopulate the range. This condition must have recurred numberless times in the past, and in the case of species having a broad distribution would appear to have provided the best possible opportunity for the origin through isolation of many strongly characterized subspecies, if not of well-marked species. On the other hand, general similarity of climate and absence of isolation appear to be strong leveling influences to hold variation within certain limits.

Lepus americanus, occupying the vast wooded area extending from the coast of Nova Scotia to western Alaska, has been subjected to numberless recurring periods of extreme abundance and extreme scarcity; and yet, through its extensive range, it now presents only a few not strongly differentiated subspecies.

EFFECT OF ISOLATION UNDER LIKE CLIMATIC CONDITIONS.

Complete isolation of rabbits under like climatic conditions may have little or great influence in the development of differences from the general stock. The small effect of isolation is shown by *Lepus americanus struthopus* on the Magdalen Islands. Another case is that of *Sylvilagus bachmani cerrosensis*, a slightly differentiated form on Cerros Island. On the other hand, isolation under like climatic conditions may give rise to marked differences of full specific value. This is well illustrated by *Sylvilagus graysoni* of the Tres Marias Islands, about 65 miles off the west coast of Mexico, which so closely resembles *S. cunicularius insolitus* of the adjacent mainland in general characters that it is impossible to doubt its origin from that species. In this case isolation, although under a closely similar climate, has been continued long enough to produce good skull characters, as well as other differences of specific value.

The most extraordinary example among American rabbits of the results of isolation under similar climatic conditions is that of *Lepus insularis* (Pl. III). This jack rabbit is peculiar to Espiritu Santo, a small island about 15 miles long, lying 4 miles offshore in front of La Paz Bay, Lower California, in the Gulf of California. The position of the island, as well as its geological formation, and the configuration of the shore on both sides of the strait show conclusively that it once formed a part of the adjacent coast. That the separation of the island was caused by the sea cutting through a narrow part of a former slender peninsula appears not only by the character of the land formations on both shores of the narrow channel but by the shallowness of the channel itself, which has only from 3 to 5 fathoms of water along the submarine ridge which extends from the mainland shore to the island with deeper water on both sides. This indicates that the island was formed within a comparatively recent period. The hot, arid climate and the scanty vegetation on the island and adjacent mainland, as would be expected, are practically identical. On the mainland *Lepus californicus xanti*, a pale form of the California jack rabbit, is plentiful. Four miles away, on Espiritu Santo, jack rabbits also are common, and their general appearance and type of skull show that they must have been derived from the adjacent mainland species. The resemblance ceases here, however, for the island animal has not only developed good skull characters but its colors have become so extremely intensified that it is commonly spoken of as the black jack rabbit.

It has been stated in several places, mainly on Bryant's authority, that this dark colored jack rabbit lives among black lava rock, where its color is protective. We failed to see any black or even very dark rock on the parts of the island visited, and in every case among the thirty or forty of the animals seen, whether sitting still or moving, they were extraordinarily conspicuous. It is quite certain that the color of this species can not be justly cited as having anything to do with protective coloration.

Probable factors in the development of this dark-colored species on the desert island are absence of any predatory mammals and extreme scarcity of birds of prey large enough to interfere with it. The only other instance known to me in which a mammal appears to defy all the laws of protective coloration is that of the black *Citellus variegatus couchi* living among the whitish limestone rocks near Monterey, Mexico. The colors of both the black jack rabbit and the black ground squirrel in their native haunts are in exaggerated contrast to their surroundings.

GENERA AND SUBGENERA.

In his Classification of the Hares and their Allies,[a] Doctor Lyon recognized five genera of North American hares and rabbits, as follows: *Lepus*, *Sylvilagus*, *Limnolagus*, *Brachylagus*, and *Romerolagus*. In addition he divided the genus *Lepus* into three subgenera, *Lepus*, *Macrotolagus*, and *Pœcilolagus;* and the genus *Sylvilagus* into the subgenera *Sylvilagus* and *Microlagus*.

The classification in the present monograph differs from the foregoing arrangement in several points. Four instead of five genera are recognized, namely, *Lepus*, *Sylvilagus*, *Brachylagus*, and *Romerolagus*. The subgenus *Pœcilolagus* is considered a synonym of the subgenus *Lepus*. *Tapeti* of Gray, with *Limnolagus* as a synonym, is considered a subgenus of *Sylvilagus*, and *Microlagus* becomes a synonym of the subgenus *Sylvilagus*.

To give subgeneric value to such characters as those shown by the species of *Pœcilolagus* and *Microlagus* would necessitate the setting up of a considerable number of additional equally good subgenera. For instance *Lepus alleni*, the type of *Macrotolagus*, differs in certain strong characters from all the other black-tailed jack rabbits, and *Lepus campestris* has some marked differences from all the Arctic hares. In other words, each well-marked species or group of related species in a genus would require the erection of a subgenus for its reception.

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[a] Smithsonian Misc. Coll. (quarterly issue), vol. 45, No. 1456, June 15, 1904.

Genus LEPUS Linnæus.

(See text figures Nos. 3, 4, and 5.)

THE ARCTIC HARES, VARYING HARES, AND JACK RABBITS.

Lepus Linnæus, Syst. Nat., ed. 10, I, p. 57, 1758. Type *Lepus timidus* Linn.

Geographic distribution.—Circumpolar. In North America from the Isthmus of Tehuantepec in southern Mexico to north Greenland and the Arctic islands (see fig. 2).

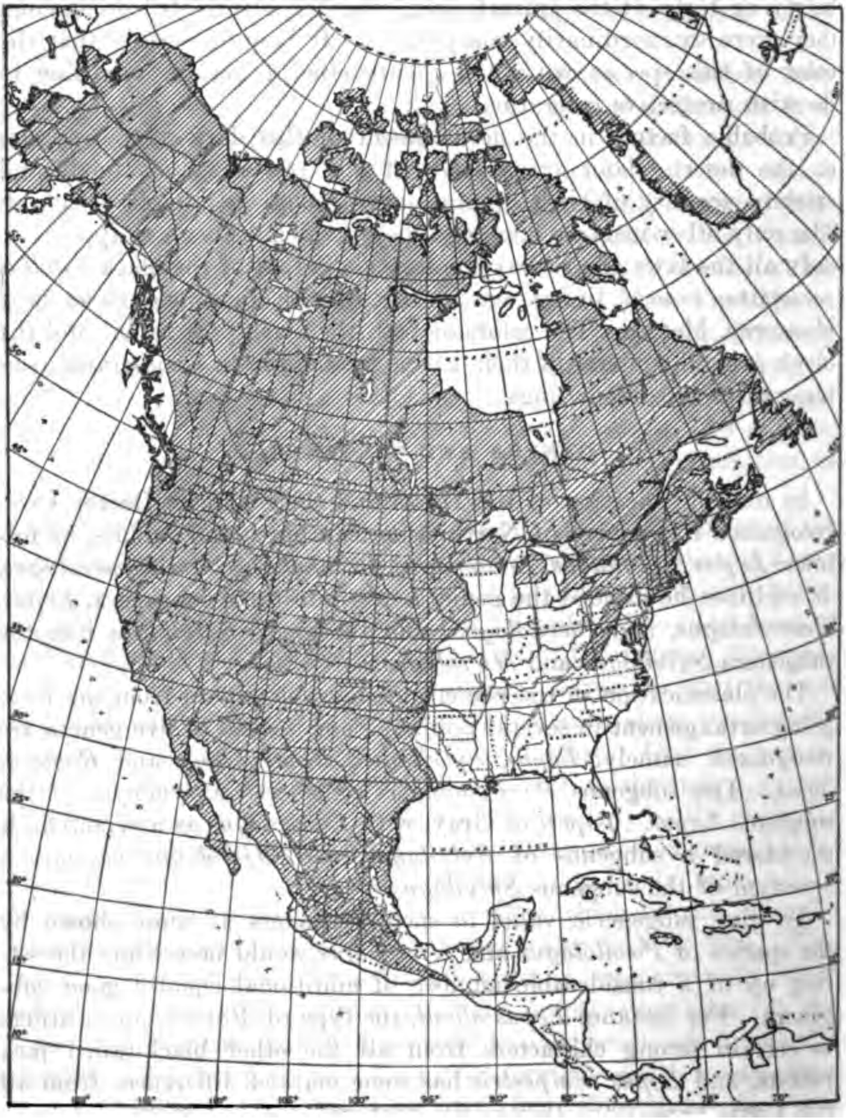

FIG. 2.—Distribution in North America of rabbits of the genus *Lepus*.

Generic characters.—Interparietal not distinguishable in adults; supraorbital usually more or less broadly wing-like and subtriangular in outline (see Pl. IV, fig. 2); second to fifth cervical vertebræ longer than broad and with strong median carination on dorsal surface; third to fifth ribs broad, flattened, and fusiform in outline on lower half; ulna much slenderer and more tapering than radius. In addition, various other skeletal characters exist.[a]

This circumpolar group is represented in North America by two subgenera, *Lepus* and *Macrotolagus*.

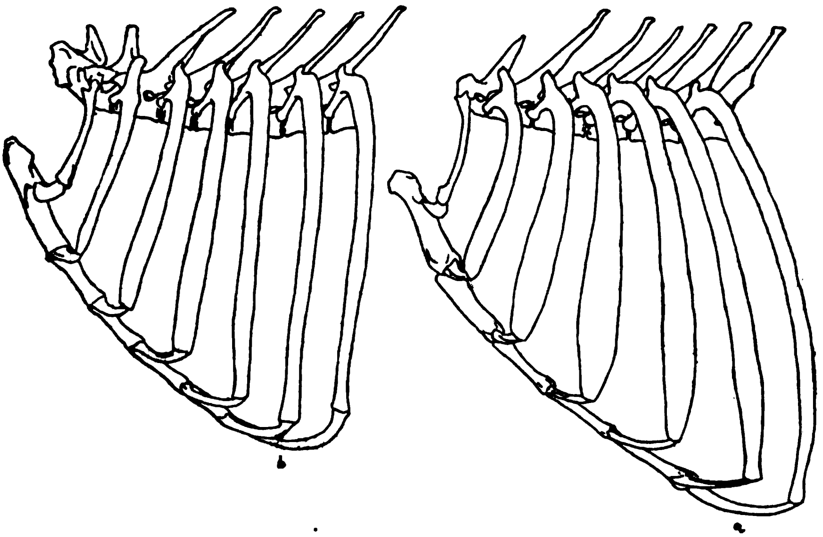

FIG. 3.—First to seventh ribs and dorsal vertebræ: *a*, *Lepus* (reduced about four-ninths); *b*, *Sylvilagus* (reduced about one-fifth).

Subgenus LEPUS Linnæus.

THE ARCTIC AND VARYING HARES AND WHITE-TAILED JACK RABBITS.

Lepus Linn. Same date and type as the genus.

Pœcilolagus Lyon, Smith. Misc. Coll. (quarterly issue), vol. 45, No. 1456, June 15, 1904. Type *Lepus americanus* Erxl.

Geographic distribution.—Northern part of the United States to the Arctic islands and north Greenland (ranging farthest south along the Alleghenies, Rocky Mountains, and Sierra Nevada).

Subgeneric characters.—Skull proportionately short, broad, and arched; supraorbitals usually strongly subtriangular and standing out broadly wing-like with a wide, open notch between the posterior process and the skull; rostrum broad and heavy; zygomatic arch broad and heavy (see Pls. IV and V).

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[a] See Lyon, Smith. Misc. Coll. (quarterly issue), XLV, No. 1456, pp. 389–394, 1904.

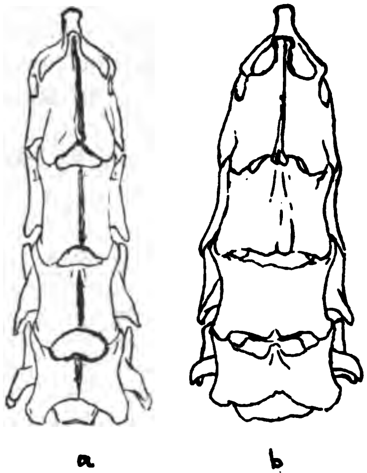

FIG. 4.—Second to fifth cervical vertebræ: *a*, *Lepus* (natural size); *b*, *Sylvilagus* (enlarged).

Two annual molts, with distinct summer and winter pelages, usually strongly contrasted in color.

Remarks.—Doctor Lyon placed the varying hares in a new subgenus, *Pœcilolagus*, but after careful examination of abundant material the writer is unable to find any character which distinguishes them more than specifically from the Arctic hares. The white-tailed jack rabbits (*L. campestris*) are almost exact intermediates in general proportions and appearance between the Arctic hares and the black-tailed jack rabbits. The skulls of the white-tailed jack rabbits are usually very distinct, but in some cases, especially in Kansas, are scarcely distinguishable from those of the black-tailed species.

Subgenus **MACROTOLAGUS** Mearns.

THE BLACK-TAILED JACK RABBITS.

Macrotolagus Mearns, Proc. U. S. Nat. Mus., XVIII, p. 552, June 24, 1896. Type *Lepus alleni* Mearns.

Geographic distribution.—Mexico and western United States.

Subgeneric characters.—Ears proportionately very long; legs and feet long and slender; skull less arched and proportionately longer and narrower, or slenderer, than in the subgenus *Lepus* (see Pl. VII, fig. 4); rostrum slender; postorbital process longer and narrower, posterior tip touching skull and inclosing a long, narrow foramen in place of a broad, open notch; spines of lumbar vertebræ longer. One annual molt.

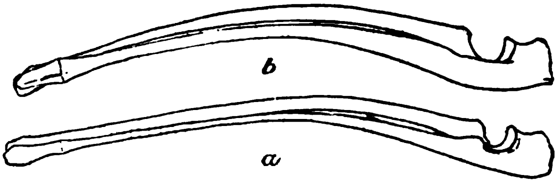

FIG. 5.—Ulna and radius: *a*, *Lepus* (reduced about one-third); *b*, *Sylvilagus* (natural size).

Remarks.—The black-tailed jack rabbits belong to the western United States and Mexico, and are especially characteristic of the desert, interior plains, and tablelands, although in climatically favorable areas they live far beyond these limits. In the southwestern United States and northern Mexico, they range entirely across the continent. They range south along the east coast from Texas to near Tampico; and on the west coast from California to northern Tepic, Mexico, and are then absent until they reappear on the shore of the Pacific at the Isthmus of Tehuantepec and range thence along the coast into the adjoining part of Chiapas. In the interior they have an unbroken distribution from southern Idaho to the Isthmus of Tehuantepec.

Although most characteristic of open, treeless plains, yet in certain regions, as in northern California and elsewhere, they occupy partly wooded country and even invade open pine forests.

This subgenus is made up of two well-defined groups: The *californicus* or gray-sided group, and the *callotis* or white-sided group. The *californicus* group, including *L. insularis*, reaches its greatest development north of the Mexican boundary, has its center in the Desert Plateau, and ranges from sea to sea along the southern border of the United States. The *callotis* group includes *Lepus callotis*, *L. flavigularis*, *L. altamiræ*, *L. gaillardi* and subspecies, and *L. alleni* and subspecies. It reaches its greatest development south of the Mexican border, and also ranges entirely across the continent.

L. alleni, the type of the subgenus *Macrotolagus*, differs strikingly from other members of the subgenus in its enormous ears, extremely long legs, and a remarkably short and peculiarly colored tail. All other members of this long-eared, long-legged subgenus have a general similarity in their comparatively shorter ears and legs and their much larger, longer, and differently colored tails.

Genus SYLVILAGUS Gray.

(See text figures Nos. 3, 4, and 5.)

THE COTTONTAILS, BRUSH RABBITS, SWAMP RABBITS, AND WOOD RABBITS.

Sylvilagus Gray, Ann. and Mag. Nat. Hist., XX, ser. 3, p. 221, 1867. Type, *Sylvilagus floridanus mallurus* (Thomas).

Geographic distribution.—Southern Canada to southern South America (see fig. 3).

General characters.—Interparietal distinct in adults; supraorbital process narrower and more strap-shaped, or tapering to a slenderer, more pointed tip posteriorly than in *Lepus;* the posterior notch or foramen usually much narrower, or even absent, owing to the union of the postorbital process along its entire length with the skull; second to fourth cervical vertebræ broader than long with dorsal surface flattened and without carination; anterior ribs of nearly uniform width throughout their length, and having a narrow, rod-like form; ulna and radius about equal in size. One annual molt. (In addition various other skeletal characters exist.)[a]

Remarks.—There appear to be two recognizable subgenera in this group, *Sylvilagus* and *Tapeti.*

Subgenus SYLVILAGUS Gray.

THE COTTONTAILS AND BRUSH RABBITS.

Sylvilagus Gray. Same date and type as the genus.

Microlagus Trouessart, Catalogus Mamm., I, fasc. III, p. 660, 1897. Type, *Sylvilagus bachmani cinerascens* (Allen).

Geographic distribution.—North and South America from southern Canada to an unknown distance in South America.

Subgeneric characters.—Skull generally averages proportionately lighter and less heavily ossified than in *Tapeti* (see Pl. IX); rostrum slenderer; supraorbitals lighter and less broadly attached to the skull; pelage finer and softer; tail larger, more abundantly haired; feet usually more heavily haired.

Remarks.—This subgenus contains all of the species of rabbits commonly known as cottontails, and also the small brush rabbits of the Pacific coast.

The brush rabbits represent a well-marked specific type, but I fail to find characters of sufficient weight to warrant their subgeneric separation from the cottontails, and therefore reject the subgenus *Microlagus* proposed by Trouessart for their reception. The small rounded tail of the brush rabbits is the strongest character separating them from the common cottontails. The light skull, with narrow pointed rostrum and slender postorbital processes, is closely similar in general type to the skulls of *Sylvilagus nuttalli* and of some forms of *S. auduboni*, and differs much less radically from them than does the skull of *S. transitionalis* from that of *S. floridanus.*

In North America *Sylvilagus*, next to *Lepus*, is the most widespread of all the subgenera of hares and rabbits. Its members range from coast to coast throughout most of the United States and south to Costa Rica. They may be arranged in four well-marked groups, which are designated by the names of their most characteristic species, as follows:

1. *Sylvilagus floridanus* group, consisting of *S. floridanus* and subspecies, with the closely related *S. robustus*, *S. cognatus*, *S. transition-*

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[a] See Lyon, Smith. Misc. Coll. (quarterly issue), XLV, No. 1456, pp. 396–401, 1904.

alis, and *S. nuttalli* with its subspecies.[a] It inhabits most of the United States, Mexico, and parts of Guatemala, Nicaragua, and Costa Rica, and ranges along practically all the Atlantic coast from Maine to Yucatan, but is absent on the Pacific coast, except from the Isthmus of Tehuantepec to Chiapas.

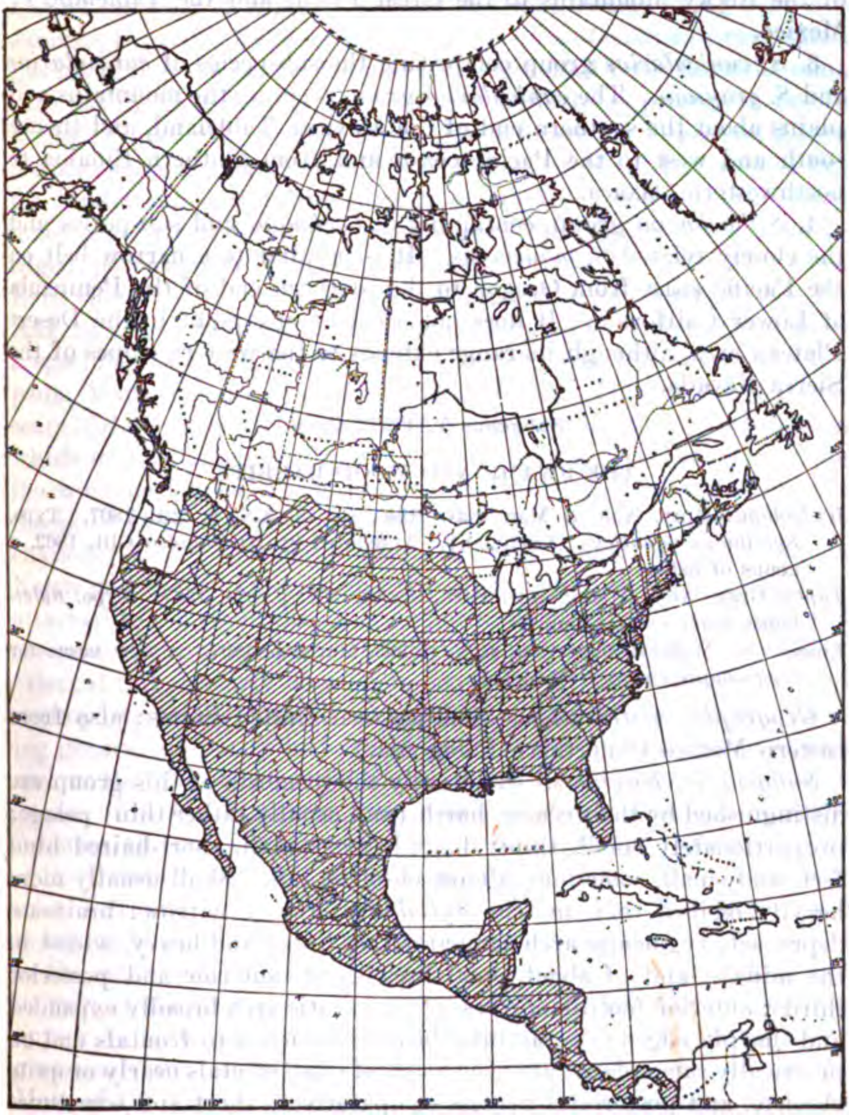

Fig. 6.—Distribution in North America of rabbits of the genus *Sylvilagus*.

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[a] For convenience *S. nuttalli* and subspecies are treated as a separate group in the text.

2. *S. auduboni* group, containing only the subspecies of *auduboni*. This group is western in distribution and ranges along the Pacific coast from near San Francisco to central Sinaloa, Mexico, and east of the Rocky Mountains to the Great Plains and the Tableland of Mexico.

3. *S. cunicularius* group comprising the subspecies of *cunicularius* and *S. graysoni*. The *cunicularius* group occupies the mountains and plains about the southern end of the Mexican Tableland, and thence south and west to the Pacific coast, and from southern Sinaloa to northwestern Oaxaca.

4. *S. bachmani* group, containing *S. bachmani* and subspecies and the closely related *S. mansuetus*. It is peculiar to a narrow belt on the Pacific coast from Oregon to the southern end of the Peninsula of Lower California. It does not occur at any point in the Desert Plateau area, although its range extends to the western slopes of the Sierra Nevada.

Subgenus TAPETI Gray.

THE SWAMP AND WOOD RABBITS.

Hydrolagus Gray, Ann. & Mag. Nat. Hist., ser. 3, XX, p. 221, 1867. Type, *Sylvilagus aquaticus* (Bachman). Antedated by *Hydrolagus* Gill, 1862, a genus of fishes.

Tapeti Gray, Ann. & Mag. Nat. Hist., ser. 3, XX, p. 224, 1867. Type, *Sylvilagus brasiliensis* (Linn.).

Limnolagus Mearns, Science, n. s., V, p. 393, March 5, 1897. A new name for *Hydrolagus* Gray, preoccupied.

Geographic distribution.—Southeastern United States; also from eastern Mexico to northern Patagonia.

Subgeneric characters.—Externally the members of this group are distinguished by their coarse, harsh (and usually rather thin) pelage; proportionately small, thinly haired ears; small, short-haired hind feet, and small, sometimes almost obsolete, tail. Skull usually more heavily ossified than in true *Sylvilagus;* rather narrow; braincase depressed; zygomatic arch comparatively broad and heavy, widest in the middle, and of about equal breadth on anterior and posterior thirds; anterior foot-like process of zygomatic arch broadly expanded and sharply edged; supraorbital broadly attached to frontals and on practically same plane; anterior notch of supraorbitals nearly or quite obsolete, and postorbital process comparatively short and sometimes completely fused to skull along entire length, or short and separated from skull by a narrow notch, or narrowly strap-shaped and touching skull at posterior end, thus inclosing a narrow foramen; bullæ small and compactly rounded. (See Pl. XII.)

The most salient skull characters, compared with *Sylvilagus*, are the depressed and comparatively narrow braincase; decurved rostrum;

flattened and broadly attached supraorbital; and heavy zygomatic arch with broadly expanded sharp-edged anterior process.

Remarks.—In 1901 Thomas definitely fixed the names *Lepus brasiliensis* Linn. and *L. tapeti* Pallas on the small rabbit living near Rio Janeiro, Brazil.[a] He described *Sylvilagus brasiliensis* as a very small species, giving the basilar length of an adult skull from Rio as 47 mm., and stating that in this specimen the postorbital process is firmly welded to the skull postorbitally. Gray based his *Tapeti* on *Lepus brasiliensis*, and characterized it as follows: "Skull like *Lepus*, but the hinder supraorbital notch narrow, the lobes short, with a sharp inner edge; the front of the lower edge of the zygoma dilated, sharp-edged, porous above; hinder nasal opening rather narrow. Tail none. Ears short." As shown by the accompanying photograph (see Pl. XII, figs. 1, 4) the skull characters given by Gray apply accurately to a specimen in the U. S. National Museum (No. 113432) from Chapada, Matto Grosso, central southern Brazil. This no doubt represents *Sylvilagus minensis* Thomas, a close relative of *S. brasiliensis*, which may be taken as typical of the subgenus. Another skull from the same locality has a narrow strap-shaped postorbital which touches the skull at the posterior end and incloses a narrow foramen. This character varies considerably also in other species of this group in North and South America, but the supraorbital in *Tapeti* is broadly attached to the skull, the anterior notch much reduced or absent, and the posterior process and notch usually proportionately short. The external tail is nearly obsolete in some South American species, and is proportionately small in all members of the subgenus. The striking general similarity in form of skull, in size of feet, ears, and tail, and in the character of the coarse, harsh pelage, of the half dozen species of rabbits examined from widely separated countries of South America, the *gabbi* group of Central America, and the swamp rabbits of the United States, is so marked that it is evident they form a closely related group. The swamp rabbit differs from the rest of the group in having the posterior process of the supraorbital more closely united to the skull along its inner border, and in much heavier claws, but in view of the strong resemblances in other respects these differences appear to be insufficient to warrant distinguishing the animals subgenerically from *Tapeti*, with which obviously they are closely allied. Most of the South American species I have had the opportunity to examine belong to this group.

Tapeti is the only American subgenus not represented within the borders of the Desert Plateau area. The Mexican and Central American representatives of the *gabbi* group inhabit dense forest undergrowth, and in this respect their habits resemble those of their forest-loving relatives, the swamp rabbits. The range of the latter in the southeastern United States is separated from the northern limit of *S. gabbi truei*, in east Mexico, by the arid treeless area which occupies the coastal region of southern Texas and Tamaulipas. This group (*Tapeti*) probably originated far to the south, and ancestors of the swamp rabbits of the United States, after pushing northward along the coastal belt, were isolated from the main body of the group by a change of climatic conditions which brought about the present gap in its range. The skull of a Mississippi specimen of *aquaticus* has the postorbital process separated from the frontals by a narrow notch, just as in the skull of *S. minensis* figured on Plate XII.

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[a] Ann. and Mag. Nat. Hist., VIII, p. 535, 1901.

Genus BRACHYLAGUS Miller.

IDAHO PYGMY RABBIT.

Brachylagus Miller, Proc. Biol. Soc. Washington, XIII, p. 157, June 13, 1900. Type, *Brachylagus idahoensis* (Merriam). Monotypic.

Geographic distribution.—Southern Idaho to central Nevada and west to northeastern California and southeastern corner of Oregon.

Generic characters.—Size small, smallest of American rabbits; ears short, broad, and rounded; tail very small, short-haired; two annual molts with differently colored pelages. Skull lightly ossified, short and very broad posteriorly; posterior prism of second lower premolar and of first and second lower molars about half as large as anterior prisms; bullæ proportionately extremely large; rostrum very small, short, and pointed; nasals short and broad; bony palate very narrow; supraorbitals attached to frontals by a narrow base; anterior and posterior processes of supraorbitals narrow, slender, and rodlike; tips usually free and truncated, giving ends of processes a curiously angular appearance; in old individuals the processes extend front and back until their tips join the skull, thus inclosing long slit-like and well-defined anterior and posterior foramina of nearly equal length; interparietal distinct; radius and ulna, ribs, and cervical vertebræ as in *Sylvilagus*. (See Pl. XII, figs. 4, 5, 6.)

Remarks.—The wide braincase with disproportionately large bullæ and small, short, and tapering rostrum produces a curious superficial resemblance between the skulls of *idahoensis* and those of very young black-tailed jack rabbits. The single species of this well-marked genus is peculiar to the sagebrush plains of the Great Basin at the northern end of the Desert Plateau.

Genus ROMEROLAGUS Merriam.

POPOCATEPETL RABBIT.

Romerolagus Merriam, Proc. Biol. Soc. Washington, X, p. 173, December 29, 1896. Type *Romerolagus nelsoni* Merriam. Monotypic.

Geographic distribution.—Volcanoes of Popocatepetl and Iztaccihuatl on slopes facing the Valley of Mexico.

Generic characters.—Size small, smallest of American rabbits except *Brachylagus;* ears short and round; feet short; external tail absent; form of body and general appearance, including pelage, much like a giant tailless *Microtus.* Clavicle complete, articulating with sternum; skull much like that of *Sylvilagus* and heavily ossified; bony palate very long; zygomatic arch very heavy, with posterior end of jugal much extended (nearly as in *Ochotona*); anterior groove in upper incisors very strong and deep; interorbital breadth narrow; supraorbitals broadly attached to frontals, much reduced, and without anterior notch; postorbital process very short and divergent, inclosing a shallow notch; interparietal distinct; caudal vertebræ nine, much reduced in size. Ulna and radius, ribs, and cervical vertebræ as in *Sylvilagus.* One annual molt (?). (See Pl. XIII, figs 1, 2, 3.)

Remarks.—The only known species of this genus is an extraordinary little animal with no known near relative, the most aberrant member of the American Leporidæ. In habits, color, and form it resembles a giant field mouse (*Microtus*), and in distribution is the most restricted of all American rabbits, being limited to a small area about 10 miles long, high up on the slopes of the two great volcanoes on the southeastern border of the Valley of Mexico.

List of species of North American hares and rabbits, with type localities.

Number of specimens examined.	Name.	Type locality.
16	Lepus arcticus Ross	Northern Baffin Land, Arctic America.
18	bangsi Rhoads	Codroy, Newfoundland.
11	canus Preble	Hubbart Point, Hudson Bay, Keewatin, Canada.
82	grœnlandicus Rhoads	Robertsons Bay, northwestern Greenland.
13	othus Merriam	St. Michael, Alaska.
10	poadromus Merriam	Stepovak Bay, Alaska Peninsula.
182	campestris Bachman	Plains of the Saskatchewan, near Carlton House, Saskatchewan.
45	townsendi (Bachman)	Old Fort Wallawalla, Washington.
11	sierræ Merriam	Hope Valley, Alpine County, California.
90	americanus Erxleben	Fort Severn, southwestern coast Hudson Bay, Canada.
69	struthopus Bangs	Digby, Nova Scotia.
146	virginianus (Harlan)	Blue Mountains, near Harrisburg, Pennsylvania.
66	phæonotus Allen	Hallock, Minnesota.
1	bishopi (Allen)	Turtle Mountains, North Dakota.
845	macfarlani Merriam	Fort Anderson, Mackenzie, Canada.
12	dalli Merriam	Nulato, Alaska.
15	columbiensis Rhoads	Vernon, British Columbia.
57	washingtoni Baird	Fort Steilacoom, Washington.
10	klamathensis (Merriam).	Fort Klamath, Oregon.
98	bairdi Hayden	Wind River Mountains, Wyoming.
21	cascadensis Nelson	Near Hope, British Columbia.
28	alleni Mearns	Rillito Station, Arizona.
26	palitans Bangs	Agua Caliente, Sinaloa, Mexico.
7	gaillardi Mearns	Playas Valley, southwestern New Mexico.
6	battyi Allen	Northwestern Durango, Mexico.
50	callotis Wagler	Southern end Mexican Tableland.
6	altamiræ (Nelson)	Alta Mira, Tamaulipas, Mexico.
28	flavigularis (Wagner)	Near Tehuantepec City, Oaxaca, Mexico.
124	californicus Gray	St. Antoine (near Jolon), California.
85	wallawalla (Merriam)	Touchet, Washington.
74	richardsoni Bachman	Near Jolon, California.
29	bennetti (Gray)	San Diego, California.

List of species of North American hares and rabbits, with type localities—Cont'd.

Number of specimens examined.	Name.	Type locality.
134	Lepus californicus deserticola (Mearns)	West edge Colorado Desert, California.
32	eremicus (Allen)	Fairbanks, Arizona.
186	texianus (Waterhouse)	Western Texas.
89	melanotis (Mearns)	Oklahoma, near Independence, Kansas.
124	merriami (Mearns)	Fort Clark, Texas.
25	asellus (Miller)	San Luis Potosi, Mexico.
9	festinus (Nelson)	Irolo, Hidalgo, Mexico.
45	martirensis (Stowell)	San Pedro Martir Mountains, Lower California, Mexico.
7	magdalenæ Nelson	Magdalena Island, Lower California, Mexico.
27	xanti Thomas	Santa Anita, Lower California, Mexico.
19	insularis Bryant	Espiritu Santo Island, Lower California, Mexico.
58	Sylvilagus floridanus (Allen)	Near Micco, Florida.
152	mallurus (Thomas)	Raleigh, North Carolina.
162	mearnsi (Allen)	Fort Snelling, Minnesota.
26	similis Nelson	Valentine, Nebraska.
126	alacer (Bangs)	Stillwell, Oklahoma.
127	chapmani (Allen)	Corpus Christi, Texas.
56	holzneri (Mearns)	Huachuca Mountains, Arizona.
30	subcinctus (Miller)	Negrete, Michoacan, Mexico.
53	restrictus Nelson	Zapotlan, Jalisco, Mexico.
49	orizabæ (Merriam)	Mount Orizaba, Puebla, Mexico.
47	connectens (Nelson)	Chichicaxtle, Vera Cruz, Mexico.
21	russatus (Allen)	Pasa Nueva, Vera Cruz, Mexico.
42	aztecus (Allen)	Tehuantepec City, Oaxaca, Mexico.
28	chiapensis (Nelson)	San Cristobal, Chiapas, Mexico.
15	yucatanicus (Miller)	Merida, Yucatan, Mexico.
8	cognatus (Nelson)	Manzano Mountains, New Mexico.
5	robustus (Bailey)	Davis Mountains, Texas.
83	transitionalis (Bangs)	Liberty Hill, Connecticut.
68	nuttalli (Bachman)	Eastern Oregon.
120	grangeri (Allen)	Hill City, South Dakota.
111	pinetis (Allen)	White Mountains, Arizona.
29	auduboni (Baird)	San Francisco, California.
77	vallicola Nelson	San Emigdio, Kern County, California.
91	sanctidiegi (Miller)	Mexican boundary, near San Diego, California.
80	confinis (Allen)	Playa Maria Bay, Lower California, Mexico.
163	arizonæ (Allen)	Beal Spring, near Kingman, Arizona.
21	goldmani (Nelson)	Sinaloa, Sinaloa, Mexico.
147	minor (Mearns)	El Paso, Texas.
85	cedrophilus Nelson	Cactus Flat, near Cliff, New Mexico.
93	warreni Nelson	Coventry, Colorado.
197	baileyi (Merriam)	Eastern side Big Horn Basin, Wyoming.
85	neomexicanus Nelson	Fort Sumner, New Mexico.
122	parvulus (Allen)	Apam, Hidalgo, Mexico.
104	cunicularius (Waterhouse)	Sacualpam, Mexico.
19	pacificus (Nelson)	Acapulco, Guerrero, Mexico.
60	insolitus (Allen)	Plains of Colima, Colima, Mexico.
21	graysoni (Allen)	Tres Marias Islands, western Mexico.
35	bachmani (Waterhouse)	Between Monterey and Santa Barbara, California.
91	ubericolor (Miller)	Beaverton, Oregon.
96	cinerascens (Allen)	San Fernando, California.
40	exiguus Nelson	Yubay, central Lower California, Mexico.
5	peninsularis (Allen)	Santa Anita, Lower California, Mexico.
4	cerrosensis (Allen)	Cerros Island, Lower California, Mexico.
1	mansuetus Nelson	San Jose Island, Gulf of California, Mexico.
20	gabbi (Allen)	Talamanca, Costa Rica.
1	incitatus (Bangs)	San Miguel Island, Panama.
15	truei (Allen)	Mirador, Vera Cruz, Mexico.
2	insonus (Nelson)	Omilteme, Guerrero, Mexico.
54	palustris (Bachman)	Coast of South Carolina.
63	paludicola (Miller and Bangs).	Fort Island, near Crystal River, Florida.
68	aquaticus (Bachman)	Western Alabama.
36	littoralis subsp. nov.	Houma, Louisiana.
44	Brachylagus idahoensis (Merriam)	Pahsimeroi Valley, Idaho.
6	Romerolagus nelsoni Merriam	Mount Popocatepetl, Mexico.

KEY TO SPECIES AND SUBSPECIES OF NORTH AMERICAN HARES AND RABBITS.

Genus LEPUS.

Subgenus LEPUS.

THE ARCTIC HARES, VARYING HARES, SNOWSHOE RABBITS, AND WHITE-TAILED JACK RABBITS.

- Ears short and broad; length from notch in dried skin averaging from 62 to 81 mm.; pelage long and thick.
  - Size larger, total length averaging more than 580 mm.; ears from notch 75 to 81 mm.; tail long, white at all seasons; underfur in winter white (the Arctic hares).
    - Pelage white throughout the year.
      - Claws very long and heavy; incisors long and projecting forward (Ellesmere Land and Greenland) ...... *grœnlandicus* (p. 67)
      - Claws not long and heavy; incisors shorter and strongly decurved (northern Baffin Land) ...... *arcticus* (p. 61)
    - Pelage gray or brown in summer.
      - Upperparts in summer iron gray.
        - Upperparts pale iron gray; a little more dusky on sides and rump than on back (Barren Grounds W. of Hudson Bay) ...... *canus* (p. 65)
        - Upperparts dark iron gray; distinctly more dusky on sides and rump than on back.
          - Head lighter buffy gray; ears with much more gray and white; bullæ larger (Baffin Land and N. Ungava) ...... *arcticus* (p. 61)
          - Head darker buffy gray; ears mainly black; bullæ smaller (Newfoundland and coast of Labrador) ...... *bangsi* (p. 64)
      - Upperparts in summer dusky brown.
        - Upperparts blackish brown; skull and feet very large (W. coast of N. Alaska) ...... *othus* (p. 69)
        - Upperparts cinnamon brown; skull nearly as in *othus;* feet much smaller (Peninsula of Alaska) ...... *poadromus* (p. 71)
  - Size smaller, total length averaging less than 520 mm.; ears from notch 62 to 70 mm.; tail short, buffy brown or dusky in summer; underfur in winter strongly tipped with zone of buffy (varying hares and snowshoe rabbits).
    - Tops of hind feet in brown pelage similar to sides of body, or a little brighter, sometimes mixed with white.
      - Total length averaging less than 450 mm.; in brown pelage underside of hind toes white or whitish, contrasting with dusky sole.
        - Upperparts dusky yellowish brown; contrast between underside of toes and sole not very strong but distinct (interior of British Columbia) ...... *columbiensis* (p. 102)

Upperparts more of a dusky reddish brown shade.

Upperparts throughout the year dusky russet brown; contrast between white toes and dusky sole strong (coast of Washington and British Columbia). ***washingtoni*** **(p. 105)**

Upperparts in summer dusky fawn color, in winter white; contrast between whitish toes and dusky sole not striking but distinct (mountains of Oregon and northeastern California)-----*klamathensis* (p. 107)

Total length averaging more than 450 mm.; in brown pelage underside of toes like soles.

Total length averaging more than 500 mm.; color in summer bright rusty brown; tops of hind feet brighter rusty than body (Virginia to Maine)-----*virginianus* (p. 92)

Total length averaging less than 500 mm.; color in summer duller and less rusty; tops of hind feet dull buffy or dull rusty mixed with some whitish.

Upperparts in summer dusky gray.

Tops of hind feet mixed rusty ochraceous and white; skull very short and broad (Turtle Mountains, North Dakota)----------------*bishopi* (p. 97)

Tops of hind feet mixed dull buffy brown and whitish; skull long and narrow (some specimens from Nova Scotia, Magdalen Islands, and Newfoundland)----------------------*struthopus* (p. 90)

Upperparts in summer dull rusty brownish or rather pale dingy rusty or dingy yellowish buffy.

Upperparts in summer dark rusty brownish (eastern Maine, New Brunswick, and Nova Scotia). ***struthopus*** **(p. 90)**

Upperparts in summer light rusty brownish or pale dingy yellowish buffy (Wisconsin to southern border of Manitoba)--------*phæonotus* (p. 95)

Tops of hind feet in summer pelage white.

Upperparts in summer dingy yellowish buffy (Lower Yukon region, Alaska)--------------------------------*dalli* (p. 100)

Upperparts in summer dusky gray, dusky, or dusky reddish.

Upperparts dusky gray or dusky yellowish gray; head paler, more buffy than body; rump about like back.

Size smaller; skull light and slender, basilar length averaging about 59 mm. (south Mackenzie and Keewatin to north shore Lake Superior). ***americanus*** **(p. 87)**

Size larger; skull large and heavy, basilar length averaging about 63 mm. (Alaska from Lake Clark east, and Canada from middle Mackenzie north). ***macfarlani*** **(p. 98)**

Upperparts dusky or dusky reddish; head distinctly more fulvous than body: rump more blackish.

Upperparts dusky grizzled with dingy gray; rump and upperside of tail blackish (Rocky Mountains from Montana to New Mexico)-----------*bairdi* (p. 109)

Upperparts dusky reddish.

Upperparts a lighter shade of dull or dusky reddish; cinnamon of head lighter; black on rump and top of tail not so heavy (Rocky Mountains, Montana to New Mexico)_______*bairdi* (p. 109)

Upperparts darker dusky reddish; cinnamon of head darker; black on rump and top of tail much heavier (Cascade Mountains of British Columbia and Oregon)__________*cascadensis* (p. 112)

Ears long and comparatively narrow, length from notch in dried skin averaging from 95 to 144 mm.

Tail always white, or white with a narrow dusky line along middle of upper side, but not extending up on rump; winter pelage white or much paler than summer (white-tailed jack rabbits).

Summer pelage yellowish gray; tail pure white (east of the Rocky Mountains, Saskatchewan to Kansas and Colorado). *campestris* (p. 74)

Summer pelage dark gray; tail white, usually more or less dusky along middle of upper side.

Smaller; hind foot averaging less than 150 mm. (Washington to SW. Colorado)_________________________*townsendi* (p. 78)

Larger; hind foot averaging more than 150 mm. (Sierra Nevada, California)_______________________________*sierræ* (p. 82)

Subgenus MACROTOLAGUS.

THE BLACK-TAILED JACK RABBITS.

Tail never entirely white; always with a distinct black line along top and on median line of rump; winter pelage similar to that of summer (black-tailed jack rabbits).

Flanks white or pale gray, similar to abdomen and sharply contrasted with back; ears without trace of black patch at tip.

Nape more or less black.

Nape with black not divided (south central Mexico). *callotis* (p. 122)

Nape with black divided into two lateral stripes by median stripe of buff.

Back ochraceous buff (south coast Oaxaca and Chiapas). *flavigularis* (p. 125)

Back more grayish, cream buff (southern Tamaulipas). *altamiræ* (p. 124)

Nape gray or grayish buff.

Size very large, ear enormous, tail very small, sides of body and rump iron gray.

Back dull cream buff (S. Arizona and N. Sonora). *alleni* (p. 117)

Back rich cream or pinkish buff (S. Sonora and Sinaloa). *palitans* (p. 118)

Size small, ears and tail medium, flanks white, rump iron gray.

Size larger (over 500 mm.); back buffy fawn color (SW. New Mexico and W. Chihuahua)__________*gaillardi* (p. 120)

Size smaller (under 500 mm.); back and head paler (NW. Durango)________________________________*battyi* (p. 121)

- Flanks similar to back, or slightly paler; ears with distinct black patch at tip.
  - Nape with more or less black.
    - Back black or blackish (Espiritu Santo Island, Lower California) ------------ *insularis* (p. 156)
    - Back dark gray or dark buffy gray.
      - Ears smaller, averaging from notch less than 115 mm. (S. Texas and NE. Mexico) ------------ *merriami* (p. 148)
      - Ears larger, averaging from notch more than 115 mm. (San Luis Potosi, etc.) ------------ *asellus* (p. 150)
  - Nape gray, dull buffy, or buffy brown.
    - Rump and adjoining parts of hind legs gray, forming distinctly paler rump patch contrasting with back and sides.
      - Back and sides pale grayish (Chihuahua and Texas north to western Colorado) ------------ *texianus* (p. 142)
      - Back and sides dark, buffy brown or ochraceous buffy.
        - Back and sides bright ochraceous buffy (Great Plains, NW. Texas to Nebraska) ------------ *melanotis* (p. 146)
        - Back and sides dark buffy brown, or grayish buffy brown.
          - Back and sides dark buffy brown; nape dark brownish buffy; size larger; ears short, averaging less than 112 mm. from notch (Gulf coast, Texas ------------ *merriami* (p. 148)
          - Back and sides dull grayish buffy brown; nape grayish buffy; size smaller; ears long, averaging 129 mm. from notch (S. end Mexican Tableland) ------------ *festinus* (p. 151)
    - Rump and adjoining parts of hind legs similar to back and sides, no rump patch.
      - Upperparts dark, varying from buffy brown to dull buffy.
        - Head and ears colored like body.
          - Size larger, upperparts rich fulvous brown (coast region middle California, Sacramento Valley) ------------ *californicus* (p. 129)
          - Size smaller, upperparts duller, more grayish fulvous brown (coast region southern California and NW. Lower California) ------------ *bennetti* (p. 136)
        - Head and ears grayer than body.
          - Ears longer, averaging from notch 116 mm.; darker gray (Cape Region, Lower California) ------------ *xanti* (p. 155)
          - Ears shorter, averaging from notch 99 mm.; paler gray (Margarita and Magdalena Islands, Lower California) ------------ *magdalenæ* (p. 154)
      - Upperparts pale, varying from gray to pale yellowish buff or pale dull grayish buff.
        - Upperparts buffy or dull grayish buff.
          - Upperparts pale yellowish or sandy buffy (San Joaquin Valley, California) -- *richardsoni* (p. 133)
          - Upperparts dull grayish, slightly pinkish buffy (southern Arizona and N. Sonora) -- *eremicus* (p. 140)

Upperparts gray or with buffiness when present reduced to a slight tinge.

Head and ears grayer than body (central Lower California) ---------------------- *martirensis* (p. 152)

Head and ears similar to body.

Upperparts paler, dull ashy gray or pale slightly buffy gray (Colorado Desert and north to Utah) ------------------- *deserticola* (p. 137)

Upperparts darker, slightly pinkish dark iron gray (NE. California to Washington) - *wallawalla* (p. 132)

Genus SYLVILAGUS.

THE COTTONTAILS, BRUSH, SWAMP, AND WOOD RABBITS.

Tail comparatively large and loosely haired, with underside always conspicuously cottony white; feet well haired (the cottontails).

Size large, largest of the cottontails, nearly equaling the jack rabbits; length averaging 480 to 511 mm.; pelage coarse and harsh (southern and western Mexico).

Upperparts brownish gray; hind legs and side of hind feet rusty brownish; tops of hind feet rusty or dull buffy.

Larger (average length 511 mm.); ears longer (averaging from notch 74.4 mm.) (S. end Mexican Tableland).
cunicularius (p. 239)

Smaller (average length 489 mm.); ears shorter (averaging from notch 70.7 mm.) (coast of Guerrero, Mexico).
pacificus (p. 242)

Upperparts deep buffy brownish or reddish brown; sides of hind legs and feet bright rusty reddish; tops of hind feet clear white or whitish, in sharp contrast.

Larger (average 500 mm.); ears longer (averaging from notch 70.4 mm.) (coast of Michoacan to Sinaloa, Mexico).
insolitus (p. 243)

Smaller (average length 480 mm.); ears shorter (averaging from notch 57 mm.) (Tres Marias I., W. Mexico).
graysoni (p. 244)

Size medium or small; total length averaging from about 350 to 463 mm.

Bullæ proportionately small with surface smoothly rounded or polished; ears usually comparatively short.

Rostrum proportionately heavy, broad and strongly angled on upper half of base, usually broad and flattened, or decurved, near tip; except in *transitionalis*, supraorbitals broad and heavy and usually ankylosed to skull at posterior end.

Supraorbitals very small, posterior process short, tapering posteriorly to a slender point, free from or barely touching skull and anteriorly narrowing until anterior process and notch usually entirely absent or obsolescent (Brasstown Bald Mt., N. Georgia, to SW. Maine).
transitionalis (p. 195)

Supraorbitals broadly developed; posterior process usually broadly strap-shaped and coalescing with skull posteriorly and sometimes along entire length; anterior process broad and commonly extended to nearly close anterior notch with squared tip.

Upperparts of body strongly grayish, varying from light to dark; always with a tinge of buffy, but general effect gray.

Upperparts of body pale buffy grayish; tops of hind feet whitish, with sides of hind feet and back of hind legs pale rusty, strongest on legs.

Small, total length averaging about 408 mm.; ears short, averaging from notch about 50 mm. (Great Plains from SW. Minnesota to near Denver, Colorado)---*similis* (p. 172)

Large, total length averaging from 425 to 451 mm.; ears long, averaging from notch about 62 to 68 mm.

Smaller, total length averaging about 425 mm.; ear from notch about 62 mm. (mountains S. Arizona and W. Mexico). *holzneri* (p. 178)

Larger, total length averaging more than 450 mm.; ears from notch about 67 mm.

Bullæ larger, averaging in diameter about 12 mm. (mountains SW. Texas)----------*robustus* (p. 194)

Bullæ smaller, averaging in diameter about 10.7 mm. (mountains central New Mexico)---*cognatus* (p. 191)

Upperparts of body dark grayish with a slight tinge of buffy; tops of hind feet whitish or pale rusty with sides of feet deep rusty or reddish brown and back of hind legs chestnut or dark rusty.

Back of hind legs dark chestnut; ear shorter, averaging from notch about 49 mm.; bullæ smaller (S. Texas and NE. Mexico). *chapmani* (p. 176)

Back of hind legs brighter, more rusty rufous; ears longer, averaging from notch 57 to 59 mm.; bullæ larger.

Size smaller, total length averaging 375 mm.; darker gray (mountains and valleys S. end Mexican Tableland). *orizabæ* (p. 183)

Size larger, total length averaging from 400 to 422 mm.; paler gray.

Smaller, total length averaging 400 mm.; bullæ larger; upperparts of body grayer and legs and feet paler (plains SE. border Mexican Tableland)----------*subcinctus* (p. 180)

Larger, total length averaging 422 mm.; bullæ smaller; upperparts of body, hind legs, and feet darker and more rusty rufous----*restrictus* (p. 181)

Upperparts of body strongly rusty reddish or rusty buffy, varying in intensity but always reddish in general effect.

Size large, average total length more than 460 mm.; skull large and massive, basilar length about 59 mm.

Upperparts darker; back and hind legs darker rufous; interorbital breadth narrower; bullæ smaller, diameter averaging less than 10 mm. (Chiapas and Guatemala). *chiapensis* (p. 189)

Upperparts paler; back of hind legs paler rufous; interorbital breadth wider; bullæ larger, diameter averaging over 11 mm. (Campeche and Yucatan)---*yucatanicus* (p. 190)

Size medium or small; total length averaging from 416 to 446 mm.

Size smaller; total length averaging less than 420 mm.; ears shorter, averaging from notch 50 to 52 mm.

Upperparts deep pinkish or rusty buffy; skull lighter and slenderer; diameter of bullæ about 10 mm. (Oklahoma to Alabama)------------*alacer* (p. 174)

Upperparts suffused with a deeper tinge of dull rusty; skull heavier, especially base of rostrum; diameter of bullæ about 11 mm. (S. Vera Cruz, Mexico)------------*russatus* (p. 186)

Size larger, total length averaging from 434 to 446 mm.; ears longer, averaging from notch 54 to 58 mm.

Tops of hind feet and front line of hind legs clear bright white, strongly contrasting with rufous on hind legs and sides of feet.

Back of hind legs rich bright rufous; top of back brighter more pinkish buffy; diameter of bullæ smaller, averaging less than 10 mm. (S. coast Oaxaca, Mexico). *aztecus* (p. 187)

Back of hind legs dull dark rufous; top of back duller buffy; diameter of bullæ greater, averaging nearly 11 mm. (S. Tamaulipas to central Vera Cruz, Mexico). *connectens* (p. 185)

Tops of hind feet and front line of hind legs not clear bright white, usually more or less strongly shaded with rusty or buffy.

Size smaller; back more brownish; back of hind legs dark brownish or chestnut rufous (Florida). *floridanus* (p. 164)

Size larger; back more pinkish buffy; back of hind legs paler and more rusty rufous.

Ears longer, averaging from notch 58 mm.; upperparts darker, more rusty reddish (eastern U. S., N. Florida to E. New York)------*mallurus* (p. 166)

Ears shorter, averaging from notch 54 mm.; upperparts paler, more pinkish buffy (northern U. S. from W. New York to Iowa)-------*mearnsi* (p. 169)

Rostrum proportionately long and slender, narrow and not strongly angled on upper half of base; outlines straight; narrow and rounded at tip; supraorbitals always light and slender, tapering to a narrow point nearly or slightly free from skull posteriorly, and inclosing a long narrow foramen or slit-like notch.

Ears longer, averaging from notch over 60 mm.

Rostrum long; supraorbitals heavy; postorbitals long; braincase broad; size large; total length averages 386 mm. (mountains from Arizona to Colorado). *pinetis* (p. 207)

Ears shorter, averaging from notch less than 56 mm.

Size smaller, total length averaging 352 mm.; bullæ smaller; gray rump patch not distinct (Washington and Oregon to W. Idaho)------*nuttalli* (p. 201)

Size larger; total length averaging 385 mm.; bullæ larger; gray rump patch more strongly marked (S. Dakota to Idaho and SE. California). *grangeri* (p. 204)

Bullæ proportionately large with surface irregularly rounded and slightly roughened; ears comparatively long (western U. S. and central and NW. Mexico).

Upperparts dull dark yellowish buffy, or dark iron gray with a slight buffy tinge.

Upperparts clear dark buffy gray, heavily washed with blackish and strongly contrasting with color on back of hind legs.

Back of hind legs deep rich rufous or rufous brown; rump patch scarcely visible (Sonora and Sinaloa, Mexico)-------------------------*goldmani* (p. 225)

Back of hind legs dull brownish; gray rump patch well marked (Lower California)-------*confinis* (p. 220)

Upperparts dull buffy gray, not heavily washed with black and not strongly contrasting with color on back of hind legs.

- Upperparts dark, rather yellowish, creamy buffy; back of hind legs dull rusty brown; rump patch fairly well marked; nape light rufous (NE. Arizona to SW. Colorado) ---------- *warreni* (p. 231)
- Upperparts dull yellowish or brownish buffy; back of hind legs dull dark brown with scarcely a trace of rusty; rump patch usually absent; nape dark rufous.
    - Size larger, total length averaging 418 mm.; color darker; rump patch absent; ears shorter (coast middle California and Sacramento Valley). *auduboni* (p. 214)
    - Size smaller, total length averaging 398 mm.; ears longer; rump patch present, not strongly marked (coast S. California and NW. Lower California). *sanctidiegi* (p. 218)
- Upperparts light yellowish buffy gray or pale gray with a slight tinge of buffy.
    - Size large, total length averaging from 402 to 411 mm.
        - Upperparts yellowish buffy distinctly darkened by overlying black wash; gray rump patch present; back of hind legs buffy brownish; skull larger; bullæ averaging less than 12 mm. (San Joaquin Valley, California) ---------- *vallicola* (p. 216)
        - Upperparts pale creamy buffy, scarcely or slightly darkened by overlying black wash; rump patch obsolete; back of hind legs pale rusty; bullæ averaging more than 12 mm. (Montana to Colorado). *baileyi* (p. 232)
    - Size small, total length averaging from 351 to 375 mm.
        - Ears shorter, averaging from notch 55 to 57 mm.; upperparts darker, more buffy.
            - Upperparts dingy, slightly yellowish gray; back of hind legs rusty brown (S. Texas to Puebla, Mexico, on Tableland) ------- *parvulus* (p. 236)
            - Upperparts light, slightly rusty, yellowish gray; back of hind legs brighter rusty (W. Texas and E. New Mexico) ---------- *neomexicanus* (p. 234)
        - Ears longer, averaging from notch 59 to 68 mm.; upperparts paler, more grayish.
            - Ears very large, averaging from notch 68 mm.; average diameter of bullæ more than 13 mm. (Arizona and SE. California) - *arizonæ* (p. 222)
            - Ears shorter, averaging from notch 59 to 60 mm.; average diameter of bullæ less than 12.5 mm.
                - Upperparts pale sandy grayish; back of hind legs dull rusty brown; underside of neck deep, dull buffy; size smaller; skull lighter (S. New Mexico, W. Texas, and Chihuahua). *minor* (p. 226)
                - Upperparts darker, more creamy buffy; back of hind legs and feet more rusty; underside of neck ochraceous buffy; size larger; skull heavier (mountains western central New Mexico and E. Arizona). *cedrophilus* (p. 229)

Tail small, short, and densely haired, or slender and thinly haired; underside of tail white, gray, or buffy; large species, total length exceeding 500 mm. and hind claws large and exposed; or small species with total length less than 400 mm. and hind claws small and concealed.

Underside of tail white.

Small, total length less than 400 mm.; tail small and round with short dense hair (brush rabbits).

Upperparts more or less strongly reddish brown.

Upperparts dark reddish brown; ears short; skull very heavy; rostrum comparatively broad and heavy; bullæ very small (coast region NW. California to Oregon). *ubericolor* (p. 250)

Upperparts dark buffy brown with a reddish suffusion; ears medium; skull light; rostrum light and pointed; bullæ medium (coast region middle California). *bachmani* (p. 247)

Upperparts grayish or grayish brown.

Rump similar to rest of back.

Upperparts pale buffy gray; ears paler than back; back of hind legs rusty (Cape Region, Lower California) ------------------------- *peninsularis* (p. 255)

Upperparts dark grayish buffy brown.

Back of hind legs grayish brown like sides of body (Cerros I.) ---------------- *cerrosensis* (p. 255)

Back of hind legs russet brown (coast region S. California and N. Lower California). *cinerascens* (p. 252)

Rump grayer than back, forming a pale rump patch.

Upperparts grayish buffy; rump patch dark iron gray; ears clearer gray than back (central Lower California) --------------------------- *exiguus* (p. 254)

Upperparts pale dingy buffy grayish; rump patch dingy gray; ears like back (San Jose I., Lower California) ------------------------ *mansuetus* (p. 256)

Large, total length more than 500 mm.; tail comparatively slender, thinly haired (swamp rabbits).

Upperparts darker and more rusty brown, especially on hind legs (narrow coast belt E. Texas to Mississippi). *littoralis* (p. 273)

Upperparts paler or more grayish brown, especially on rump and hind legs (middle Texas to Oklahoma, and east to S. Illinois and Alabama) --------------------------- *aquaticus* (p. 270)

Underside of tail dingy gray or buffy.

Tops of hind feet whitish; ears from notch about 60 mm. (mountains of Guerrero, Mexico) -------------------------- *insonus* (p. 264)

Tops of hind feet strongly ochraceous or reddish; ears from notch less than 50 mm.

Tops of hind feet and legs dark reddish; hind feet thinly haired; hind claws very large and exposed (swamp rabbits).

Ear longer, averaging from notch about 52 mm.; upperparts paler, more grayish (N. Florida to Virginia). *palustris* (p. 266)

Ear shorter, averaging from notch about 45 mm.; upperparts darker, more reddish (S. Florida) -- *paludicola* (p. 269)

Tops of hind feet and legs bright rusty ochraceous; hind feet more thickly haired; hind claws small and concealed (tropical wood rabbits).

Size larger, total length about 420 mm. (San Miguel I., Panama) __________ *incitatus* (p. 261)

Size smaller; average total length less than 390 mm.

Top of head and nape brighter reddish; ears shorter; skull lighter and slenderer (Honduras to Panama). *gabbi* (p. 259)

Top of head and nape duller reddish; ears longer; skull heavier (Mexico to Guatemala) ______ *truei* (p. 262)

Genus ROMEROLAGUS and BRACHYLAGUS.

Tail absent or almost rudimentary; smallest of American rabbits; total length less than 325 mm.

Tail absent; ears very short; general appearance *Microtus*-like (volcanoes on east side Valley of Mexico) _________ *Romerolagus nelsoni* (p. 279)

Tail extremely short, nearly unicolor; ears longer; general appearance more like the cottontails (Nevada, Idaho, NE. California, and SE. Oregon). *Brachylagus idahoensis* (p. 275)

Genus LEPUS Linn.

LEPUS ARCTICUS Group (Subgenus LEPUS).

ARCTIC HARES.

The Arctic hares of North America are representatives of a well-known circumpolar group. The American species *L. arcticus*, *L. a. bangsi*, *L. a. canus*, *L. grœnlandicus*, *L. othus*, and *L. poadromus* are characterized by large size and strictly Arctic distribution (see fig. 7). Throughout most of their range they summer north of the tree limit, but in winter sometimes penetrate a hundred miles or more into the northern border of the timber. In winter they reach Fort York, Keewatin, Fort Rae, Mackenzie, and points in the interior of Ungava. They are resident in Newfoundland, where they inhabit open hilltops and barrens in more or less forested country.

In Alaska their summer home is on the open tundras of the coast and along the west shore south to the Peninsula of Alaska. In winter they penetrate the partly wooded interior about as far as Nulato. On the east side of the continent they range south to Great Whale River on the east shore of Hudson Bay and along the coast of Labrador to the straits of Belle Isle and across into Newfoundland, where the group reaches its southern limit. To the north they inhabit all the Arctic islands and the coast of Greenland to the extreme northern limit, beyond 83° north latitude. The northernmost species, *grœnlandicus*, is one of the largest, while the southern representative, *bangsi*, is the smallest of the group. All the species have two annual molts. The winter pelage is always snowy white, including the underfur, except small black tips to the ears. The summer pelage is gray or brown, except in the case of *arcticus* and *grœnlandicus*.

Arcticus in the southern parts of its range has the usual gray summer pelage, but in the northern part of Baffin Land its summer pelage is white, almost as in winter. *L. grœnlandicus* has the two regular molts, but remains white throughout the year. It is the most differentiated of the American species, owing to its remarkably projecting incisors and large claws.

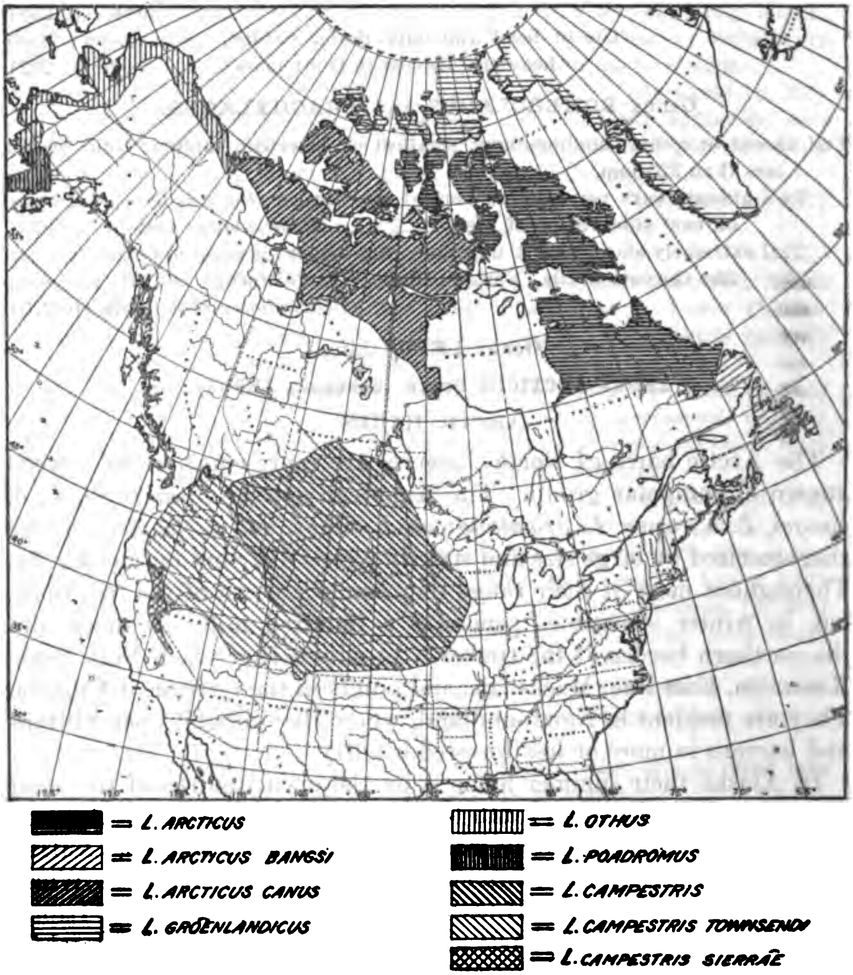

FIG. 7.—Distribution of *Lepus arcticus* and *L. campestris* and allied forms.

Arctic hares swim freely across the small streams which in spring traverse the Arctic barrens in all directions. *L. arcticus*, including its subspecies, has the widest distribution of any American species. *L. othus* and *L. poadromus*, of the tundras of western Alaska, are restricted to a narrow coast belt, and in summer are the darkest of the species. In summer pelage the Arctic hares are darker on the sides of the body and rump than on top of the back. This is a reversal of the distribution of color in cottontails and jack rabbits, in which the sides of the body and rump are commonly distinctly paler than the top of the back. While this darkening of the rump and sides appears to be opposed to the law of protective coloration, the color scheme may be satisfactorily explained by peculiarities of environment.

Average measurements in the Lepus arcticus group.

	No. of specimens averaged.	Skin.				Skull.							Origin of specimens averaged.
		Total length.	Tail vertebræ.	Hind foot.	Ear from notch, in dried skin.	Basilar length.	Length of nasals.	Breadth of rostrum above premolars.	Depth of rostrum in front of premolars.	Interorbital breadth.	Parietal breadth.	Diameter of bullæ.	
Lepus arcticus	5	...	...	...	80	74.4	42.5	26.9	27.6	32.8	34.7	12.3	Northern Ungava.
Lepus arcticus bangsi	5	596	63	164	81	73.7	39.9	26.3	22.3	31.0	34.0	11.3	Newfoundland.
Lepus arcticus canus	2	...	...	...	80	75.4	37.7	26.7	23.4	31.6	34.5	12.2	Barrens west of Hudson Bay.
Lepus grœnlandicus	5	664	73	146	75	78.0	40.0	27.7	23.8	34.1	35.5	12.5	Northwest Greenland and Ellesmereland.
Lepus othus	(a)	...	...	176	75	79.5	41.1	28.6	25.8	34.4	34.1	12.0	St. Michael and Nulato, Alaska.
Lepus poadromus	(b)	600	53	147	78	76.5	39.5	26.5	24.5	32.6	34.4	12.0	Alaska Peninsula.

[a] Three skins; 5 skulls.

[b] One skin; 5 skulls.

LEPUS ARCTICUS Ross.

American Arctic Hare.

(Pl. IV, fig. 2; Pl. V, fig. 2.)

Lepus arcticus Ross, Voyage of Discovery, ed. 2, II, Appendix IV, p. 151, 1819. Type from latitude 73° 37′ in northern Baffin Land, southeast of Cape Bowen; collected by John Leach.

Lepus glacialis Leach, in Ross's Voy. Discovery, ed. 2, II, Appendix IV, p. 170, 1819. Same type and locality as *arcticus*.

Lepus labradorius Miller, Proc. Biol. Soc. Washington, XIII, pp. 39–40, May 29, 1899. Cotypes from Fort Chimo, Ungava, Canada, skull 23132 and skin 14149, adults, U. S. National Museum; collected by L. M. Turner, September 28, 1882.

Geographic distribution.—Baffin Land, and probably adjoining islands to the west; extreme north coast of Hudson Bay and south across Hudson Strait to include most of Ungava to Great Whale River on the east shore of Hudson Bay, and Labrador north of Hamilton Inlet. Vertical range from sea level to an undetermined altitude; zonal range, Arctic.

General characters.—In winter white, except small black tips to ears; in most of Baffin Land whitish in summer also, but in this condition always distinguishable from *grœnlandicus* by smaller size and much smaller and slenderer claws; in southern Baffin Land and Ungava in summer upperparts of head and body change to dull buffy gray; ears blackish in front and white behind, with subterminal whitish band isolating a black tip.

Color in summer pelage (*Ungava and southern Baffin Land*).—Top and sides of head always paler than body, varying from dull grizzled silvery gray, with a faint tinge of dull buffy, to a dull grizzled buffy gray; the buffy clearest, less grizzled with gray, on top of nose and sides of head; upperparts of neck and body dull, rather dark, iron gray; underfur tinged with dull brownish buffy; upperparts of body grizzled with dull silvery gray, the grizzling most abundant on top of back; sides of body darker and less grizzled with silvery gray than back; rump still darker and less grizzled, forming a poorly marked dusky rump patch; nape similar to top of back; tail entirely white; ears on front of outer half blackish, or on basal two-thirds dusky grizzled gray; posterior half whitish (or blackish at base and whitish on most of terminal part, except tip); a whitish band across front of outer part near tip, thus isolating the small black tip; posterior border of ear strongly edged with white; tops of fore feet white; outside of fore legs dusky like flanks; hind feet white, sometimes thinly grizzled with dusky hairs; outside of hind legs like rump; underside of neck dusky smoky gray and, like lower border of flanks, only slightly grizzled with gray; rest of underparts white.

Color in summer pelage in northern part of Baffin Land.—Entirely dull whitish except black tips to ears.

Color in winter pelage.—Entirely pure white except small black tips to ears.

Skull (*Ungava specimens*).—Strong and massive; rostrum broad, deep, and heavy, slightly tapering; nasals broad, heavy, slightly arched; frontal area strongly depressed with a hump-like swelling on crown immediately back of depression; supraorbital process rather small and irregularly rounded-triangular in form, standing high above plane of frontals and projecting wing-like from skull; the posterior end of postorbital processes forming blunt points, which reach a bony process on squamosals only in very old, much ossified specimens; anterior notch broad and deep and irregular in form; posterior notch very broad and ovate; top of braincase depressed, with median and lateral ridges developed enough to give it an indistinctly angular form; premaxillaries forming a shorter, stouter mandible compared with that of *grœnlandicus;* the short, strong incisors abruptly downcurving; molar series broad and heavy; incisive foramina very broad posteriorly; postpalatal fossa broad and deep; bullæ comparatively small and flattened below, giving an oblong form transverse to axis of skull, and strongly embedded in bony tissue; upper outline of skull giving a double arch, one in front of and one behind depressed frontal area.

The only available skull representing typical *arcticus* from Baffin Land, that of a young adult belonging with the skin of the head and neck described below, is not sufficiently developed to afford good characters. It is closely like the series from Ungava in the comparatively narrow jugal and the comparatively short upper mandible, with short and abruptly down-curving upper incisors; bullæ smaller and more deeply embedded in surrounding bony tissue than in the Ungava specimens or in *grœnlandicus*.

Remarks.—From the available material I can find no characters by which to separate *labradorius* from *arcticus*. Kumlien states that the hares on the southern end of Baffin Land commonly remain white all summer, but that others become more or less extensively gray on the upperparts. A young of the year in first adult pelage from Niantilik Harbor, Cumberland Gulf, southern Baffin Land, now in the U. S. National Museum, has the head and neck colored as follows: Top and sides of head dingy yellowish-buffy gray, becoming dull whitish about eyes and dull buffy white on sides of nose; ears glossy black on front half of outside and a broad patch of same color on inside near posterior border; outside of ears, on posterior half, blackish at base and dingy white thence to near tips, where they change to narrow, pure white, subterminal bands, which extend as subterminal rings around ears and isolate the small jet black tips; posterior border of ears edged with pure white; neck smoky, slightly brownish gray, finely and rather thinly grizzled over surface with whitish gray.

There is evidently considerable individual variation in the summer coloration of these hares, and two summer specimens from Fort Chimo, Ungava, differ considerably in the amount of white on the back of the ears. A third specimen from Solomon Island, on the north coast of Labrador, has a paler (dark ashy) gray head than those from Fort Chimo, with ears glossy black except for a little grizzling of gray near the base in front and on the inside, and a narrow white edge along the entire posterior border. In the nearly uniform black ears, lacking the subterminal whitish band, this specimen closely approaches *bangsi*. A specimen shot at Fort Chimo on June 10 is just changing into summer pelage. The underside of the head, ears, underside of body, and rump still retain the white winter coat, but the white woolly winter fur has come off the back en masse, leaving the half-grown gray summer coat exposed on practically the entire back and sides of body. The top and part of the sides of the head are in the dingy, grayish buffy summer coat. The subterminal white or whitish band isolating the black tips on the ears appears to be a common character in *arcticus* and *canus*, and is not very uncommon in *bangsi*.

The scarcity of specimens of *arcticus* and most of its American relatives, especially in summer pelage, renders it difficult to determine satisfactorily the relationship and distribution of the various forms.

Total number of specimens examined 16, from:

Franklin (Canada): Cumberland Island (Baffin Land), 1; Niantilik (Cumberland Gulf), 1.
Ungava (Canada): Fort Chimo, 7; Solomon Island, 1.
Keewatin (Canada): Cape Fullerton (Hudson Bay), 6.

LEPUS ARCTICUS BANGSI Rhoads.

NEWFOUNDLAND HARE.

Lepus arcticus bangsi Rhoads, Am. Naturalist, XXX, p. 236, March, 1896 (author's separates published February 20, 1896). Type from Codroy, Newfoundland, No. 3752, ♀ ad. Museum of Comparative Zoology (Bangs collection); collected by Ernest Doane, August 3, 1895.

Geographic distribution.—Newfoundland and probably adjacent part of Labrador north to Hamilton Inlet, and extreme eastern Quebec. Vertical range from sea level up to an undetermined altitude; zonal range, Arctic.

General characters.—Much like southern representatives of *arcticus*, but head duller buffy, grizzled with gray; body in full summer pelage grizzled smoky gray, but ears mainly glossy black except for a white line along posterior border and grizzling of buffy gray on basal third in front.

Color in summer pelage.—Top of head grizzled buffy gray, paler than back; sides of head deeper and clearer, usually more fulvous buffy about eyes and back to base of ears, the buffy varying in intensity; back varying from dark iron gray to paler iron gray slightly shaded with dull buffy; rump always blackish; underfur dull brownish, sometimes slightly tinged with dull cinnamon buffy becoming paler toward base, and sometimes with a light plumbeous basal zone; sides of body and outside of legs darker and less grizzled with gray than back, though not so dark as rump; tops of fore feet plain white or grizzled with dusky gray; tail white, sometimes with a narrow median line of dusky; ears glossy black with some grizzling of gray about base in front and on inside, and a narrow white line along posterior border; two out of six specimens have ears entirely black except the white line along posterior border; one other has the ears all black except gray border around entire edge and a grizzling of same on front and inside; three others have the back of ears on posterior half mainly whitish except for broad black tip, the posterior border white, and the inside and anterior part of outside, including anterior border, grizzled with gray, the gray in one specimen forming a subterminal band across front, thus isolating the well-marked glossy black tip; neck below and on sides even more blackish than lower flanks and like rump much darker than back; this blackish becomes darkest on underside of neck; underside of head blackish, about the same shade as sides of neck; sides of flanks darker near lower border and along sides of abdomen; inguinal area sometimes dusky gray or even blackish gray; otherwise underparts of body pure white.

Color in winter pelage.—Entirely pure white except small black tips to ears.

Skull.—Closely similar to that of *arcticus*, from which it is practically indistinguishable.

Average measurements (*5 adults*).—Total length, 596; tail vertebræ, 63; hind foot, 164; ear from notch in dried skin, 81.

Remarks.—*L. a. bangsi* appears to lack definite skull characters and rests only on color differences. The nearly uniform black ears and dusky median line sometimes present on top of the tail are the main differences from representatives of *arcticus* from Ungava. One skull of *bangsi* is remarkable for the unusual development of the supraorbital. In this individual the postorbital process extends back until the point meets and rests against a process on the squamosal, while the anterior process extends forward as a broad strap-shaped bone fusing along the inner side to the upper part of the vertical ridge of the malar in front of the orbit. The anterior notch is reduced to a small rounded foramen; the posterior notch to a large rounded foramen.

The opinion prevails in Newfoundland that the rapid increase of *L. a. struthopus* on the island since its introduction about forty years ago has resulted in the marked decrease of Arctic hares. Arctic hares are reported to have been formerly common and generally distributed, but of recent years to have decreased in numbers, and those remaining are said to be limited to the barren hilltops.

It is difficult to understand why a species so strictly limited to wooded areas as *struthopus* should seriously affect species of the open country, such as the Arctic hares, even when the areas they occupy are intermingled. The letter from Mr. Howley quoted in the remarks on *L. a. struthopus* states the local belief in this matter.

Total number of specimens examined 18, from:

Newfoundland (Canada): Bay of Islands, 1; Bay St. George, 13; Codroy, 2; St. Johns, 2.

LEPUS ARCTICUS CANUS Preble.

Hudson Bay Arctic Hare.

Lepus arcticus canus Preble, N. A. Fauna No. 22, pp. 59–61, October 31, 1902. Type from Hubbart Point, west coast of Hudson Bay, Keewatin, Canada; No. 106860, ♂ ad., U. S. National Museum (Biological Survey Collection); collected by E. A. Preble, August 17, 1900.

Geographic distribution.—Barren Grounds of northern Canada south to York Factory, Keewatin, and northern shores of Great Slave and Great Bear lakes. Vertical range from sea level up to an undetermined altitude; zonal range, Arctic.

General characters.—Closely similar to specimens of *arcticus* from Ungava, but the three available summer specimens differ in the paler tone of gray on the head and body and the greater amount of whitish and gray on the ears.

Color in summer pelage.—Top and sides of head dull buffy gray; top of nose dull fulvous buffy; back and sides of body slightly paler iron gray than *arcticus;* sides of body nearly like back, but a little less grizzled and darker; rump patch dusky, but not so dark as in *arcticus;* outside of fore and hind legs and feet white, or with a little gray on legs; front half of outside of ears blackish, strongly grizzled with gray and bordered along front edge with whitish; posterior half of outside of ears blackish at base and white thence to near tip, including a distinct white line along posterior border; white area on back of ears extending as a subterminal whitish band across front and inside, thus isolating a small black tip as in *arcticus*, but the white band broader in *canus;* underside of neck plumbeous gray slightly grizzled with whitish gray like sides of body; rest of underparts white.

Color in winter pelage.—Entirely pure white except small black tips to ears.

Skull.—The single adult skull examined from the type region (Fort Churchill) is absolutely indistinguishable from skulls of *arcticus* from Ungava.

A skull from Fort Rae is remarkable for the strong frontal depression, the plane of the depression extending far out on the top of the rostrum. The rostrum is proportionately long and unusually narrow, the bullæ are small and deeply embedded, and the molars are small. A Fort Anderson skull is narrow and slender, with the supraorbitals strongly ossified on both anterior and posterior processes. These skulls probably represent more nearly the typical skulls of the form called *canus* than those from the coast of Hudson Bay, which are nearer *arcticus*.

Remarks.—This is a poorly marked subspecies, distinguishable from *arcticus* mainly by the slightly paler color of the upperparts and the larger amount of white on the ears in summer. Unfortunately I have seen skins of only three immature summer specimens, so the constancy of this difference is yet to be determined.

A specimen in the National Museum, less than half grown, from Cambridge Bay, Victoria Land, differs strikingly from any other seen. It has the upperparts dull tawny, or slightly cinnamon buffy, grizzled with whitish; the ears dusky, grizzled with pale gray in front and inside, and the white margin on posterior border extending as a narrower dingy buffy whitish band across front and inside of ear, isolating a small black tip. The specimen is so different from anything seen from elsewhere that it appears possible there may be an undescribed form on the islands north of the Barren Grounds.

The southern breeding limit of *canus* is marked by the northern limit of trees. This limit can be roughly marked by a line drawn from Fort Churchill, on the west side of Hudson Bay, northwesterly, passing a little north of Great Slave and Great Bear lakes. In winter they range south some distance into the partly wooded region, reaching at least as far as Fort Rae, Mackenzie, and York Factory, Keewatin.

Since the foregoing account of this form was written additional information has been secured. Through the courtesy of Dr. J. A. Allen, of the American Museum of Natural History, I have had the opportunity to examine two specimens of *canus* collected by E. T. Seton and E. A. Preble on August 14 and 19, 1907, at Aylmer Lake, Mackenzie, and find that they confirm the validity of this form. The smaller of the specimens differs but little from the type, except that the upper surface of the fore feet and legs is dull grayish brown and the nape, sides of body, and rump are suffused with more blackish; the sides of the body being a clearer, more dusky gray. The larger of these specimens[a] has the ears almost completely jet black on both sides; the middle of the back is a little darker gray than the type, and the nape, sides of body, and rump are much more blackish; the rump, broad lateral line, and underside of head and neck are distinctly blackish with dark plumbeous gray underfur, the blackish of the lateral line encroaching on the sides of the abdomen, restricting the white median area. The top and sides of head are dark, slightly buffy gray with a dull buffy suffusion on ocular area. The top of the head is much like the middle of the back, differing mainly in its slightly buffy tinge.

Total number of specimens examined 11, from:

Franklin: Cambridge Bay, Victoria Land, 1.
Keewatin: Fort Churchill, 2; Hubbart Point, 2.
Mackenzie: Fort Anderson, 1; Fort Rae, 3; Aylmer Lake, 2.

LEPUS GRŒNLANDICUS RHOADS.

GREENLAND HARE.

(Pl. IV, fig. 1; Pl. V, fig. 1.)

Lepus grœnlandicus Rhoads, Am. Naturalist. XXX, p. 236, March, 1896 (author's separates issued February 20, 1896). Type from Robertson Bay, northwestern Greenland, No. 1486, ad., Academy of Natural Sciences, Philadelphia; collected by C. E. Hite, August 2, 1892.

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[a] Am. Mus. Nat. Hist., No. 29060.

Geographic distribution.—Northwestern coasts of northern Greenland and Ellesmere Land. Vertical range from sea level to an undetermined altitude; zonal range, Arctic.

General characters.—Larger than *arcticus;* head and body of adults white throughout the year, but changing in summer from the snowy white of winter to a more grayish white; ears in winter pure white, in summer mainly dusky gray, with a small black tip at all seasons; claws very large; upper incisors extremely long and projecting.

Color in summer pelage.—Top of head varying from dusky grayish white to pale dull whitish buffy; sides of head and back slightly dusky whitish, the duskiness due to a thin intermixture of black hairs; outside of ears on posterior half, most of inside and subterminal band across front white, isolating a small dusky or black tip; basal two-thirds of front half of outside of ears dusky gray, sometimes tinged with dull buffy; rest of head, body, legs, and feet pure white.

Color of winter pelage.—Entirely pure white, except small jet black tips to ears.

Juvenal pelage.—Top of head a varying shade of brownish buffy grizzled with whitish tips to hairs; sides of head buffy whitish; entire upperparts of neck and body varying from dull whitish with a slight buffy suffusion to dull whitish buffy, darkest on top of back and palest on sides; feet and legs similar to sides of body; entire underparts pure white; front half of outside of ears varies from dingy yellowish buffy to dull buffy whitish; inside of ears similar but paler; back of ears white; tip with a small dusky point; top of head and ears always darker than back; no sign of a dark gray summer pelage similar to that of *arcticus* in the southern part of its range.

Skull.—Size large (exceeded among American forms only by that of *othus*); above generally similar in form to that of the subspecies of *arcticus*, but the premaxillæ taper anteriorly to a long narrow point, from which extend the extremely long, slightly curved, and outreaching upper incisors, giving a slender beaklike form to the upper mandible, in strong contrast to its form in all other American species.

Average measurements (5 adults).—Total length, 664; tail vertebræ, 73; hind foot, 146; ear from notch in dried skin, 75.

Remarks.—This is one of the most strongly differentiated forms among the known Arctic hares of America. Its excessively heavy, wool-like coat of fur, the great development of the claws, and the remarkably long tapering upper mandible, with the extremely long, extended, slightly curved upper incisors, are characters not approached by any of its known relatives on this continent. So far as known it is confined to the north coast of Greenland and Ellesmere Island, its distribution appearing to coincide with that of the northern musk ox (*Ovibos wardi*).

The stout fossorial claws and long outreaching incisors of this species are evidently developed to assist in obtaining food in a region where the extreme rigors of a high Arctic climate and the dwarfed vegetation on land hard frozen and covered with ice and snow so large a part of the year make it difficult for rodents to maintain themselves.

The excessive thickness of the pelage on this species gives the coat a woolly or fleece-like effect. The young (which are about one-third grown in July) have an odd resemblance to very young lambs, owing to their dingy whitish woolly coats.

In the spring molt the old pelage is so matted that it comes off in large patches, leaving shreds and ends hanging to the still attached portions, thus giving the animals a rough and ragged appearance.

Arctic hares are known to occupy both coasts of southern Greenland, but I have seen no specimens from that region, and therefore am unable to give any further information concerning them. From their distribution, however, they should be most closely related to *grœnlandicus*, but no doubt differ at least subspecifically from that species. The notes regarding them by Brown, in his paper on the Mammals of Greenland, indicate that, unlike *grœnlandicus*, they become brown in summer (P. Z. S., 1868, p. 351.)

Total number of specimens examined 32, from:

Ellesmere Land: Bache Peninsula, 1; Buchanan Bay, 4.

Greenland: Cape Alexander, 2; Holstenberg, 1; Northumberland Island (near Cape Alexander), 15; Olriks Bay, 1; Robertson Bay, 4; Sonntag Bay, 1; Woodland Bay, 3.

LEPUS OTHUS MERRIAM.

ALASKA TUNDRA HARE.

Lepus othus Merriam, Proc. Washington Acad. Sci., II, p. 28, March 14, 1900. Type from St. Michael, Alaska; No. 15883, ad. (skull only), U. S. National Museum; collected by L. M. Turner, February, 1877.

Geographic distribution.—Tundras of northern and northwestern Alaska, exclusive of the Peninsula and Bristol Bay section. Vertical range from sea level up to over 2,000 feet altitude; zonal range, Arctic.

General characters.—Largest of the American Arctic hares, even exceeding *grœnlandicus;* feet very large; color much darker and more dusky brownish in summer than any other American form.

Color of summer pelage (*Kotzebue Sound*).—Top of head blackish brown, finely grizzled with buffy gray; top and sides of nose and about mouth dark cinnamon buffy; this cinnamon buffy area extends up on top of nose, dividing at forehead, and extends back on each side as a darker, more reddish cinnamon area covering sides of head around eyes and inclosing a narrow pure white orbital ring; a patch on each side of nose, in front of eyes, distinctly grizzled gray overlying the cinnamon under color; posterior half of cheeks and basal two-thirds of ears in front dusky, grizzled with buffy, like top of head; terminal third of anterior outer half of ears, and a band extending to base of ears back of the dusky anterior area, glossy black; tip and a long patch on posterior part of inside of ears blackish; posterior half of ears on outside dusky grayish becoming pure white along terminal half of posterior border; inside of ears crossed by a broad subterminal cinnamon buffy band isolating the blackish tip; nape and top of back dark dusky brown, shading into a slightly grayer or more plumbeous brown on sides and entirely covered with a fine thin grizzling of gray; tail white with scattered dusky hairs on upper side; front of fore legs and top of fore feet grizzled dark brownish buffy; outside of hind legs similar to sides of body but becoming dingy buffy along anterior border; tops of hind feet white; rump dull blackish brown with scanty grizzling, thus forming a poorly defined dusky rump patch; underside of neck dusky smoky gray grizzled sparsely with clear gray; rest of underparts white.

Color of winter pelage.—Pure white except small black tips of ears.

Skull.—Large and massive; largest of the American Arctic hares, even exceeding in size the skull of *grœnlandicus*, from which the short, heavy mandible and strongly incurved upper incisors at once distinguish it; general proportions and appearance closely like that of *arcticus*, but much larger, with very broad and heavy zygomatic arch, anterior end of zygomatic arch heavier and more smoothly rounded than in the other forms.

Remarks.—The present species is remarkable for its dark blackish brown color in summer, its large size, massive skull, and extremely large hind feet. The dark color contrasts strikingly with the pale iron grays of the summer pelage in *canus* and other eastern forms of *arcticus*. While only one summer skin has been available, yet a fairly good series of over a dozen good adult skulls from various localities agree in their great size and other characters, which appear to confirm the validity of *othus* as a well-marked species. *Lepus othus* is extremely rare in collections. The only summer specimen I have seen is the Kotzebue Sound example in the Philadelphia Academy of Sciences, which is described above. It is possible that material from the northern coast east of Point Barrow may prove the intergradation of *othus* with *canus* or *arcticus*, but the series now available shows no signs of this.

Total number of specimens examined 13, from:

Alaska: Kotzebue Sound (Choris Peninsula), 1; Nulato River, 1; St. Michael, 10; Yukon, 1.

LEPUS POADROMUS Merriam.

Alaska Peninsula Hare.

Lepus poadromus Merriam, Proc. Washington Acad. Sci., II, p. 29, March 14, 1900. Type from Stepovak Bay, Alaska Peninsula; No. 98068, ad., U. S. National Museum (Biological Survey collection); collected by Charles Palache, July 9, 1899.

Geographic distribution.—Peninsula of Alaska and Bristol Bay district of Alaska. Vertical range from sea level up to an undetermined altitude; zonal range, Arctic.

General characters.—In summer, upperparts dull cinnamon brown, becoming distinctly rusty or reddish cinnamon on head; tail very small, dusky gray above and below; front feet brownish cinnamon; hind feet white.

Color in summer pelage.—Head grizzled rusty brownish cinnamon, becoming plain dull dark reddish cinnamon about nose and around eyes on sides of head; a narrow patch of dull buffy on upper and lower eyelid; front of fore legs and tops of fore feet grizzled brownish cinnamon a little paler than sides of head; entire back and sides of body dark cinnamon brown more dusky and less reddish than head, and finely but thinly grizzled with dull buffy or dull grayish buffy; rump more dusky than top of back and forming a poorly defined dusky rump patch; outside of hind legs dull cinnamon brown much like back, but a little paler; tops of hind feet white; tail smaller and shorter than in any other member of the group, and otherwise strikingly peculiar in being dusky gray above and dingy gray below, the color on upperside being produced by a mixture of grayish white and blackish hairs; underside of neck dull slightly cinnamon brownish, a little duller than sides of body; chin whitish, shading back into dull whitish gray on rest of underside of head; middle of underside of body from breast to base of tail and inside of legs pure white; sides of abdomen mainly dull brownish gray; outside of ears in front grizzled cinnamon brown, much like back, but becoming more dusky on terminal half; outside of ears on posterior half whitish, becoming pure white along posterior border; anterior border on terminal half whitish, shading into a small, indistinct, dusky tip; inside of ears brownish and dusky overlaid and mixed with grayish white hairs.

Skull.—Closely similar to *arcticus*, but rather slenderer, with nasals averaging shorter; distinguishable at once from *othus* by small size and slender proportions.

Measurements (1 skin).—Total length, 600; tail vertebræ, 53; hind foot, 147; ear from notch in dried skin, 78.

Remarks.—This species, judging from the single summer skin at hand, is the most strongly marked externally of any member of the group. Its dark cinnamon-brown color and short dusky tail being quite unlike anything else. With such striking external markings the surprising lack of characters in the skulls, of which a good series of adults is in the Biological Survey collection, is remarkable. So far as known, *poadromus* has a very restricted distribution. A broken skull from Nushagak, at the head of Bristol Bay, is like skulls of *poadromus* from Becharof Lake. A winter skin from Nushagak is pure white with small black tips to the ears, showing that this species has the customary winter pelage.

Total number of specimens examined 10, from:

Alaska: Between Portage Bay and Becharof Lake (Alaska Peninsula), 6; Cold Bay (Alaska Peninsula), 1; Kewatna Bay, Shelikoff Strait (Alaska Peninsula), 1; Nushagak, 1; Stepovak Bay (Alaska Peninsula), 1.

LEPUS CAMPESTRIS Group (Subgenus LEPUS).

WHITE-TAILED JACK RABBITS.

Strictly speaking, the white-tailed jack rabbits are hares, and belong to the subgenus *Lepus*. The group consists of a single species, *L. campestris*, and its two subspecies, *townsendi* and *sierræ*. They are large, heavy bodied animals, with a combination of external and skull characters which place them in a nearly intermediate position between the typical Arctic hares and the black-tailed jack rabbits of the subgenus *Macrotolagus*. The long ears and long, slender legs give *campestris* and its subspecies much similarity in form to the black-tailed jack rabbits, while the skull is much more like those of the *arcticus group*. This intermediate character of *campestris* is made still more significant by the fact that its range also is in the country intermediate between the areas occupied by the Arctic hares and the black-tailed jack rabbits (see fig. 4). The close resemblance between occasional skulls of *campestris* and of *Lepus californicus melanotis* from overlapping parts of their ranges on the southern part of the Great Plains has been mentioned elsewhere.

The type of *campestris* came from the extreme northern border of its range, near Carlton House, on the plains of the North Fork of the Saskatchewan River, Canada. From that region south it occupies the Great Plains, lying east of the Rocky Mountains, to Kansas and Colorado. Within the United States the species crosses the Rocky Mountains and extends through the Great Basin to the east slopes of the Sierra Nevada and Cascade Mountains. East of the Rocky Mountains only typical *campestris* is known, but west of these mountains differences in local conditions have modified the species into two geographic races, *townsendi* and *sierræ*. *L. campestris* as a species is usually characteristic of broad, open plains, but it follows open country up mountain slopes to altitudes varying from 10,000 to 12,000 feet in both the Rocky and the Sierra Nevada mountains (see fig. 7). The southern border of their range overlaps the northern part of the range of the black-tailed jack rabbits.

In the northern and most elevated parts of their range, wherever the winters are severe and accompanied by regular snowfall, *campestris*, *townsendi*, and *sierræ* have a nearly pure white winter pelage, its thickness and whiteness increasing northward. In the extreme southern parts of their ranges, where the winters are milder and the snowfall irregular, the winter coat is rarely or never as completely white as it is farther north, but is more or less buffy on the head and upperparts of the body. In summer the top of the back, sides of the body, and rump are practically of the same shade; but in winter specimens in which the change of color is incomplete, the rump and sides of the body are distinctly paler than the top of the head and back, thus imitating imperfectly the distribution of color on the white-sided jack rabbits. The subspecies *townsendi* commonly has the top of the tail mixed with black, and this character is most strongly developed in southwestern Colorado. One specimen from Coventry, Colorado, has the top of the tail occupied by a broad band of black, almost as large as in a strongly marked form of the black-tailed group, and in this region narrow but continuous median black lines on the tail are usually present. In true *campestris* the tails are nearly always uniformly white and never so strongly marked as in these extreme cases of *townsendi*. The ranges of the subspecies *campestris* and *townsendi* meet along the summit of the Rocky Mountains in Colorado. Using the color of the upperparts in summer pelage as a criterion, specimens from the east and west drainages of the Rocky Mountains fall respectively into two sets marked by color differences; typical *campestris* is yellowish buffy, while *townsendi* and *sierræ* are distinctly gray. Northern specimens of *campestris* in full white winter pelage have a strong general resemblance to winter specimens of Arctic hares; but the buffy tips of the underfur of *campestris* contrasted with the pure white underfur of the Arctic hares is an unmistakable character.

Average measurements of Lepus campestris and subspecies.

	No. of specimens averaged.	Skin.				Skull.							Origin of specimens averaged.
		Total length.	Tail vertebræ.	Hind foot.	Ear from notch, in dried skin.	Basilar length.	Length of nasals.	Breadth of rostrum above premolars.	Depth of rostrum in front of premolars.	Interorbital breadth.	Parietal breadth.	Diameter of bullæ.	
Lepus campestris........	5	605	92	149	95.6	74.2	40.2	26.4	28.3	29.8	31.7	12.1	Eastern Colorado and Wyoming.
Lepus campestris townsendi.	5	575	79	149	102	70.8	38.7	24.4	22.2	29.1	30.9	11.9	Washington and Oregon.
Lepus campestris sierræ.	1	635	112	167	108	[a]71.4	39.0	25.4	23.0	30.0	32.2	12.1	Hope Valley, California (type).

[a] The skull of the type is broken; the skull measurements given here are the averages of two adults from Mono Lake, California.

LEPUS CAMPESTRIS BACHMAN.

WHITE-TAILED JACK RABBIT.

(Pl. IV, fig. 3; Pl. V, fig. 3.)

Lepus campestris Bachman, Journ. Acad. Nat. Sci. Philadelphia, VII, pt. 2, pp. 349–353, 1837. Type from plains of the Saskatchewan, Saskatchewan, Canada, probably from near Carlton House; collected by John Richardson.

Geographic distribution.—Great Plains of Saskatchewan in Alberta, Saskatchewan, and Manitoba, Canada, and thence south on plains of the United States, east of the Rocky Mountains, over Montana, Wyoming (except extreme southwestern part), the Dakotas, Minnesota to extreme southeastern corner (Lanesboro), Iowa east to the Mississippi River (Muscatine), Nebraska, northern half of Kansas, Colorado east of summit of the Rocky Mountains, and middle northern border of New Mexico. Vertical range from less than 1,000 feet in Iowa up to at least 10,000 feet on the mountains of Colorado; zonal range, mainly Upper Sonoran and Transition on the plains of the western United States, extending into Canadian on the mountains and in the northern part of its range.

General characters.—A large, heavy bodied species, usually with the tail at all seasons entirely white; two annual molts; upperparts of body in summer becoming light yellowish buffy; in winter pure white, except in extreme southern part of range, where back becomes pale buffy gray and sides of body and rump whitish; ears always buffy or buffy gray with black tips, except in winter in extreme northern part of range, where mainly white with black tips.

Color in fresh summer pelage.—Top and sides of head and body nearly uniform, varying from a pale dull golden gray to dull yellowish buffy gray, usually underlaid and darkened by the brownish color of underfur showing through; sides of head slightly paler or grayer than back, with sides of nose and ring around eyes white (yellowish buffy in young individuals); nape pale dull buffy, varying to buffy whitish and dull grayish; rump similar to rest of back, but a little paler on sides; entire tail usually white, but sometimes with more or less dusky hairs along middle of upperside, even to the extent of forming a narrow, dusky median line; front and outside of fore legs, including tops of fore feet, dingy buffy, sometimes more or less tinged with grayish and sometimes with ochraceous; outside of hind legs a little duller and usually more of a drab gray than back; tops of hind feet whitish, sometimes tinged with buffy; rump in midsummer similar to rest of back, but pale (especially on sides) in early spring and late fall; underside of neck varies from dull buffy with a grayish tinge to dull ochraceous buffy; rest of underparts white; ears on outside of anterior half dusky brownish, heavily washed with ochraceous buffy and varying to paler buffy gray; anterior border strongly edged with ochraceous buffy, varying to dull buffy or grayish buffy in the grayer-eared specimens; posterior half of outside of ear white, with a broad terminal black patch extending to include border of ear at tip; inside of ear with a long dusky patch near posterior side more or less grizzled with buffy or buffy gray, and a paler, more whitish, or buffy whitish edging along posterior border.

Winter pelage.—In the northern part of the range—Canada, Montana, Wyoming, the Dakotas, and Minnesota—the summer coat changes in winter to pure white, except irregular areas on tops of fore feet, on top of nose, and about eyes, which become fulvous buffy; front and inside of ears become deep rusty or reddish ochraceous buffy underlaid with dusky or dark buffy gray, well-marked patch at posterior tip always glossy black, as in summer pelage; underfur on back, neck, and head usually dark pinkish buffy approaching reddish brown in some specimens and showing more or less through wherever the heavy overlying white coat is disturbed.

In southern part of range from Colorado, east of Rocky Mountains, through Kansas and Nebraska, winter change much less complete; head, ears, back, and sides of body merely become much paler buffy than in summer and rump and hind legs whitish with a slight buffy wash. Some individuals, notably from Denver, Colorado, and Valentine, Nebraska, have rump, shoulders, and sides of neck and body more whitish than top of head and middle of back; the latter area grayish buffy in the Denver specimen and whitish with a strong brownish tinge in the Nebraska one. One winter specimen from El Paso County, Colorado, has head, ears, and body dark buffy, nearly as in summer, but rump distinctly paler and more dirty whitish, forming a well-marked rump patch.

Skull.—Comparatively short, high arched, with extremely broad nasals, giving a broad blunt rostrum; interorbital area strongly depressed between high-arched, wing-like supraorbitals; anterior process of supraorbital well developed and inclosing a deep, irregular notch; postorbital process short, broad at base, and tapering rapidly to a blunt point, which usually stands out widely divergent from skull, with a broad, deep notch between; but not rarely the posterior point extends back to meet a bony process on squamosal and thus incloses a broad obovate foramen; braincase broad, depressed, or flattened above, more or less angularly ridged on sides; bullæ medium sized, proportionately smaller than in the *Lepus californicus* group; rather flattened below and irregular in outline; zygomatic arch massive; malars broad, flat, with a deep pit anteriorly; molar series broad and massive; rostrum deep and broad at base, with premaxillaries tapering to a slender and projecting point and long incisors, thus giving this part of rostrum below nasals a more strongly extended form than in the black-tailed jack rabbits, with incisors less strongly incurved; postpalatal fossa very broad and deep.

Average measurements (*5 adults*).—Total length, 605; tail vertebræ, 92; hind foot, 149; ear from notch in dried skin, 95.6.

Remarks.—Summer specimens of *campestris* show considerable individual variation in color on the upperparts of the head and body, from dark yellowish buffy, with the underlying dusky brownish ground color showing through and darkening the general effect, to a much paler and brighter, or more golden, buffy varying to grayish buffy. The yellowish shade is always present and usually strongly marked as compared with the clearer gray of *townsendi* and *sierræ*. In full summer pelage in all parts of its range this form appears to have the rump very slightly if any paler than the back. The traces of black or dusky along the top of the tail are more often present in summer than in winter, and are most frequently present in specimens from the southern half of its range. The change into the pale winter pelage takes place between the last of October and the end of November. Usually the first change is the appearance of a paler rump patch. One individual from Park County, Montana, had scarcely begun to change on October 25, while one from Valentine, Nebraska, had taken on the pale winter coat by November 13. Midwinter specimens from Denver and from El Paso County, Colorado, have strongly buffy backs, darker than those from Nebraska at the same season. There is a great amount of variation in the winter coat between these buffy backed Colorado animals and the pure white ones from farther north. The reddish buffy or buffy brown color of underfur of the white winter animals varies much in intensity and in the amount of suffusion it shows about the head and neck. A February specimen from Fort Custer, Montana, has the strong reddish, almost chestnut brown, color on the underfur showing conspicuously through the rather thin overlying layer of white on the surface of the upperparts, especially on the neck. The surface of the white on the middle of the back in this specimen is washed with rusty buffy, giving the appearance of a slightly scorched area; the tops of the fore feet are rich rusty buffy and the hind feet strongly patched with a paler shade of the same, mixed with white.

The various stages of the molt into summer or winter pelage, in addition to individual variation, make up an almost endless amount of difference among individuals of this species. True *L. campestris* appears to be limited to the region east of the Rocky Mountains. Two specimens from central northern New Mexico belong here. The darkest and most brownish buffy individual seen is one shot October 10 in Trego County, Kansas. Two specimens, one-fourth grown, collected at Fort Pierre, South Dakota, the last of May, have a slightly reddish brown shade over the entire upperparts and are washed and grizzled on the surface with silvery gray.

A series of four adults from Madison, Minnesota, are the largest examined from any part of the range, and unless these individuals were chosen by the collector from a large number on account of their size, then *campestris* must reach its greatest average size in this region.

The type of *campestris* was a mutilated hunter's skin in winter pelage. It was collected by Richardson, who states that the species was common on the plains of the North and South Saskatchewan rivers. E. A. Preble, in the light of his knowledge of the country and of the work of the early explorers in northern Canada, considers it probable that Richardson's specimen came from near Carlton House, on the lower course of the North Fork of the Saskatchewan River. Preble considers Richardson's northern limit of 55° latitude for the species as almost certainly erroneous. The specimen killed by Drummond in September on the North Saskatchewan above Carlton House is the northernmost record we know for this species. The amount of white in the winter pelage increases steadily to the northward until near the northern border of its range *campestris* in winter becomes almost as completely white externally as the Arctic hares.

Total number of specimens examined 132, from:

Manitoba (Canada): Carberry, 1.
Saskatchewan (Canada): Indian Head, 1.
Alberta (Canada): Greenfield, 1.
Minnesota: Grant County, 2; Madison, 4.
Iowa: Ruthven, 3.
North Dakota: Devil Lake, 1; Fort Pierre, 1; Fort Union, 1; Harrisburg, 1; Mandan, 1.

South Dakota: Corral Draw, 4; Deadwood, 1; Fort Meade, 1; Pierre, 1; Rapid City 2; Sioux Falls, 1.

Nebraska: Fort Kearney, 1; Loup Fork, 1; Perch, 1; Platte River (90 miles above Fort Kearney), 1; Valentine, 1.

Kansas: Coyote Station, 2; Garden City, 2; Lawrence, 2; Long Island, 1; Red Fork (60 miles west of Fort Riley), 1; Winona, 6; Trego County, 4.

Montana: Chief Mountain, 1; Cinnabar, 1; Fort Custer, 2; Frenchman River, 1; Little Dog Creek, 1; Porcupine River, 1; Powder River, 1; Robare, 1; Three Buttes, 2; Yellowstone River (Three Buttes), 1.

Wyoming: Big Piney, 1; Bitter Creek, 1; Bridger Pass, 5; Cheyenne, 2; Deer Creek, 6; Devil Tower, 1; Douglas, 2; Fettermann, 1; Fort Sanders, 1; Fort Steele, 1; Medicine Bow Mountains, 1; Meriden, 1; Newcastle, 3; Percy, 6; Rock Creek, 1; Spring Creek, 1; Wamsutter, 2; Woods post-office, 1; Yellowstone Park (head of Glenn Creek), 1.

Colorado: Antonito, 1; Cache la Poudre River, 1; Colorado Springs (15 miles east), 1; Como, 1; Deer Creek, 1; Denver, 1; East Dale, 1; Eastonville, 2; Fort Garland, 1; Longmont, 1; Loveland, 5; Medano Ranch (15 miles northeast of Mosca), 6; Mount Whiteley (25 miles north of Kremmling), 1; Payton, 1; Salida, 1; Sterling, 1; Villa Grove, 5.

New Mexico: Hopewell, 1.

LEPUS CAMPESTRIS TOWNSENDI BACHMAN.

WESTERN WHITE-TAILED JACK RABBIT.

Lepus townsendi Bachman, Journ. Acad. Nat. Sci. Philadelphia, VIII, pt. 1, pp. 90–94, pl. II, 1839. Type from old Fort Walla Walla, Washington; ♀ yg.; (present location unknown; probably no longer extant); collected by J. K. Townsend.

Geographic distribution.—Great Basin region, including east slopes of Cascade Range, and thence east to Rocky Mountains, occupying eastern Washington and Oregon, and north to Fairview, in Okanogan Valley, British Columbia; and from the northeastern corner of California easterly through northern Nevada, western and southern Idaho, extreme southwestern Wyoming, most of Utah, and Colorado from western border to summit of Rocky Mountains. Vertical range from about 1,000 feet in eastern Washington to 12,000 feet in Colorado; zonal range mainly Upper Sonoran and Transition, but reaches up to Hudsonian in the mountains of Colorado.

General characters.—In summer similar to *campestris*, but head and body nearly uniform gray, entirely lacking the yellowish buffy shade of *campestris*. Winter specimens in white pelage not distinguishable from *campestris*, except by the smaller size and narrower black tips to ears; in southwestern Colorado, winter specimens not white, but top of back becomes pale creamy or buffy gray, contrasting with the bright yellowish, almost golden buffy, backs of some winter specimens of *campestris* from east of the mountains in Colorado.

Color of fresh summer pelage.—Head and upper parts of body nearly uniform dark gray, varying from an almost silvery tone to a duller and slightly pinkish gray with an underlying brownish shade; underfur tipped with dusky brownish, darker and less buffy than in *campestris;* front of fore legs and tops of fore feet dull grizzled buffy gray, sometimes becoming dingy buffy on tops of feet; outside of hind legs varying from plain dull gray to drab gray; tail white, sometimes with a considerable amount of dusky or black, forming a narrow but well-marked median line on top; tops of hind feet white, sometimes with a slight mixture of gray, or a little buffy about toes; nape dingy gray, sometimes with a smoky brown or dull buffy brown suffusion; front half of outside of ears dusky gray; posterior half white with a distinctly more restricted black tip than in *sierræ* or *campestris;* inside of ear with a dusky area along posterior side and bordered anteriorly with dull rather pale ochraceous buffy; posteriorly bordered with white, the latter sometimes suffused with deep buffy; tip of ears in front edged with black; orbital area and sides of nose sometimes more or less strongly shaded with cinnamon buffy; underside of neck dull drab grayish shaded with brownish or dull buffy, distinctly less yellowish and more brownish gray than in *campestris.*

Color of winter pelage.—Specimens from Utah, Nevada, and thence north become white in winter and practically indistinguishable from *campestris* except by smaller size and less black on tips of ears; winter specimens from southwestern Colorado become much more whitish than in summer, but, as in the case of *campestris* east of the mountains in that State, only a partial change takes place. In strong contrast to the bright yellowish buffy backs of Colorado specimens of *campestris* in winter, *townsendi* from the same State at this season becomes much paler or more whitish on shoulders, sides of body, and rump, and paler buffy gray on top of head and back; the ears become paler and grayer than in summer; nape grayish white; top of tail white with dusky along median line on top, varying from scattered hairs to a strong well-marked black band in several specimens from Coventry, in one case equaling ordinary *texianus* in amount of black; tops of fore feet and legs dingy buffy brownish or dull grayish buffy; outside of hind legs whitish or dull whitish gray; underside of neck varying from dull brownish buffy to dull écru drab, always more or less strongly washed with whitish or lighter buffy; well-marked rump patch dull whitish, varying to pale dull iron gray.

Two white winter specimens from Utah have head and ears much as in ordinary *campestris.*

Winter pelage (Osoyoos, British Columbia, January 28, 1909).—Upperparts of head and body pale gray, a little darker on top of head and more whitish gray on sides of head, body, outside of thighs, and on rump; tops of hind feet dull whitish mixed with dull gray, with a little dull buffy on sides of feet and toes; tops of fore feet and legs dingy grayish buffy; outside of ears in front slightly darker gray than top of head; tip of ears with a narrow black border in front and a small black patch about half an inch long behind; underside of neck dull buffy washed with whitish, rest of underparts pure white.

This specimen shows no trace of the salmon buffy so conspicuous on the head, ears, and legs of winter specimens of *L. townsendi sierræ.*

Skull.—Closely similar in general appearance to that of true *campestris*, but averages smaller and lighter, with rostrum narrower; bullæ smaller; palatine foramina narrower; postpalatal fossa narrower; and molar series smaller. As in *campestris* old, much ossified, specimens have point of postorbital process extending back to touch small process on squamosals, thus inclosing a broad foramen; anterior process of supraorbitals in such individuals often extends forward and nearly or quite closes anterior notch.

The skull differences given above are merely average, as many skulls of the two forms are practically indistinguishable. Skulls from western Colorado are larger than in typical *townsendi*, and in many instances are indistinguishable from those of *campestris* from east of the mountains in that State.

Average measurements (*5 adults*).—Total length, 575; tail vertebræ, 79; hind foot, 149; ear from notch in dried skin, 102.

Remarks.—For many years *Lepus townsendi* was confused with *campestris* until properly characterized by Doctor Merriam in a revision of the *campestris* group published in 1904.[a] It occupies most of the elevated plains and open mountain slopes of the Great Basin, and becomes white in winter throughout most of its range, except in the plains of the Columbia and southwestern Colorado, where the change appears to be incomplete. The summer pelage from western Colorado is very close to that of typical *townsendi*, but the dusky or black line on the upper side of the tail is much more strongly developed and in some cases approaches its condition in the black-tailed jack rabbits. *L. c. townsendi* intergrades with *campestris* in middle southern Colorado. One young individual from Antonito on the south central border of the State is as gray as typical *townsendi*, though several adults from the same section are nearer *campestris*, though evidently intergrades. An April specimen from Delta County is even a little darker gray than summer specimens of *townsendi* from the type region, but the front border and inside of the ears are strongly ochraceous buffy, the head and body are tinged slightly with brownish, the tops of the fore feet are more buffy, and the underside of the neck more vinaceous buffy. This specimen is almost exactly duplicated in every character by one in a similar condition of pelage from Goose Lake, California, which is within the area occupied by typical *townsendi.*

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[a] Proc. Biol. Soc. Washington, XVII, pp. 131–133, 1904.

The material collected by Warren in Colorado during the summer of 1907 contains some interesting records. These specimens prove the extension of the range of *townsendi* into Middle Park and up to the extraordinary altitude of 12,000 feet, where two specimens were secured on Mount Baldy, above Boreas Pass, in Summit County. Among these specimens those from Kremmling in Middle Park, Yampa, Routt County, and McCoy, Eagle County, are intermediate in color between typical *townsendi* and *campestris*, but are so much grayer than the latter that the writer refers them to *townsendi.* The Colorado specimens of *townsendi*, as previously noted, have distinctly larger skulls than those nearer the type locality. A Kremmling specimen is the darkest example of *townsendi* the writer has seen, being a dusky brownish gray. This color is largely due to the strong dusky subterminal area on the long hairs and the dark buffy brownish tips. In July and August these specimens frequently have the front of the ears blackish or dusky brownish, owing to the wearing off of the overlying long hairs, thus exposing the dark under color.

Specimens from the headwaters of the Arkansas River at Salida and from San Luis Valley, Colorado, are in color intergrades between *campestris* and *townsendi*, but in size are nearest *campestris.* A series of winter specimens from Coventry, Colorado, agree in having the sides of the body and the rump whitish, with the top of the back covered with a buffy grayish mantle, thus producing a color pattern very similar to that of the *callotis* group of white-sided jack rabbits. There is considerable variation in the shade of the buffy gray mantle on the backs of the Coventry series.

In a letter dated February 14, 1909, Mr. C. de B. Green, of Fairview, British Columbia, gives the first definite information concerning the distribution and abundance of *L. c. townsendi* in British Columbia, as follows:

" With regard to this animal I may tell you that from 1893 to 1903 it was exceedingly rare and, from the statements of the Indians and old inhabitants, always had been rare. I can show how rare when I say that during those ten years I shot three specimens. It is a fact which may or may not bear on the case that in 1903 I cleaned out the dusky horned owls from this neighborhood; in 1905 I shot 23 hares and about the same in the succeeding years. I think these owls kept the hares near the point of extinction. I notice that the golden eagles are now making serious raids upon them. Their range is in a tract of land along the Okanogan Valley about 2 miles wide and terminating at Fairview, 20 miles north of the boundary line; also in Similkameen Valley for 20 miles north of the boundary. So far they have not spread farther north and there is little or no country suitable for them. The grease brush ends at Dog Lake and they will probably spread as far as that if vermin are kept down, for I shot a pioneer at White Lake, which is as far north as Dog Lake, but farther west. This may have come either from Keremeos, via Similkameen, or from Fairview, via the Okanogan."

Total number of specimens examined 45, from:

British Columbia: Fairview (Okanogan Valley), 1.
Washington: Asotin, 2; Kennewick, 1; Mabton, 1; Oroville, 1; Pullman, 1; Touchet, 1.
Oregon: Antelope, 1; Guano Creek, 1; Heppner, 1; Umatilla, 1.
California: Fort Crook, 1; Goose Lake, 1.
Nevada: Ruby Valley, 2.
Utah: Kanab, 1; Ogden, 2; Salt Lake, 1.
Idaho: Bear Lake, 1; Lemhi River, 1; Teton Basin, 1.
Wyoming: Hams Fork, 1; Henrys Fork, 1.
Colorado: Baldy Mountain (Summit County), 2; Coventry, 4; Crawford, 1; Crested Butte, 1; Kremmling, 1; McCoy, 1; Mill City, 1; Sulphur Springs (Grand County), 8; Yampa, 2.

LEPUS CAMPESTRIS SIERRÆ MERRIAM.

SIERRA WHITE-TAILED JACK RABBIT.

Lepus campestris sierræ Merriam, Proc. Biol. Soc. Washington, XVII, pp. 132–133, July 14, 1904. Type from Hope Valley, Alpine County, California. No. 67863, ♀ ad., U. S. National Museum (Biological Survey collection); collected September 9, 1894, by F. Stephens.

Geographic distribution.—In summer, high slopes of Sierra Nevada of California, probably from Mount Shasta south to Mount Whitney; in winter, ranging down the east slope to Mono Lake region on the sagebrush plains of eastern California. Vertical range in summer from about 9,000 to over 12,000 feet; zonal range, Boreal.

General characters.—Size large; hind feet much larger and ears longer than in *townsendi* or *campestris;* color in summer nearly as in *townsendi;* in winter white, with front of ears, top of head, and fore feet strongly pinkish buffy or fulvous; ears strongly tipped with black.

Color in summer (*type*).—Scarcely distinguishable from *townsendi;* top of head, with back and sides of body, nearly uniform dull grizzled gray; sides of head nearly same color as body, with a narrow white ring about eyes, sides of nose deep fulvous buffy; tops of fore and hind feet whitish (perhaps due to change into winter pelage); front half of outside of ears like top of head, but strongly tipped with black; outside of ears on posterior half whitish, with a broad black patch at tip; inside of ears bordered with dull fulvous buffy, tipped with black; tail white, with a narrow dull gray median line on top; underside of neck similar to sides of body; rest of underparts white.

Winter pelage.—White, with the buffy of underfur showing through on head and upperparts of body enough to give a tinge of buffy or brownish; top of head with a surface mixture of grayish or dull buffy; sides of nose, front half of ears on outside, borders of inside of ears, and tops of front feet usually more or less strongly vinaceous buffy or fulvous buffy, giving a much brighter shade to these parts than in *campestris;* tips of ears strongly margined with black anteriorly and with a broad black patch posteriorly.

Color in changing pelage in fall (*Mono Lake, November*).—Head and upperparts of body lighter gray than in summer and rump changing to dingy whitish; fore and hind legs and feet white, with tops of fore feet more or less overlaid with vinaceous buffy; sides of nose and exposed parts of ears vinaceous buffy varying to fulvous buffy with a less marked tinge of same mixed with gray on sides and top of head; some individuals have head and ears grayer, with a duller tinge of buffy on sides of nose and on ears, more as in summer but paler.

Skull.—Scarcely distinguishable from that of *townsendi.*

Measurements (*type*, ♀ *ad.*).—Total length, 635; tail vertebræ, 112; hind foot, 167; ear from notch in dried skin, 108.

Remarks.—The range of *sierræ* appears to be restricted to the higher parts of the Sierra Nevada and adjacent eastern slope of California in the Mono Lake region. Its strongest characters appear to be the extraordinarily large hind feet and long ears. The summer pelage, to judge from the type, is very similar to that of *townsendi.* A series of ten fall and winter specimens of *sierræ* from Mono Lake, California, differ strikingly from *campestris* at this season in the strong vinaceous buffy on the ears, about the nose, and on top of the fore feet of a majority of the series. This contrasts strongly with the buffy (dark ochraceous buffy in richly colored specimens), or buffy gray, on the ears and heads of winter specimens of *campestris.* Among the Mono Lake series, however, are a few specimens which are not different in color from *campestris.* The vinaceous buffy on head, ears, and feet in most autumnal and to a less degree in white winter specimens from Mono Lake is strongly contrasted with the dark gray of the ears and dark fulvous buffy on the sides of the nose of the series of summer specimens of typical *townsendi* and of the type of *sierræ.* If the winter specimen of *townsendi* from Osoyoos, British Columbia, is typical, then the differences between the winter pelage of this form and *sierræ* are well marked. The backs of the November specimens from Mono Lake are lighter and a little more buffy than the summer pelage, though much grayer and less yellowish than *campestris* in the same pelage. So far as the material at hand indicates, *sierræ* becomes white in winter to the southern limit of its range. Although so large and conspicuous when moving about, they usually lie so closely hidden and are so strictly nocturnal that they are rarely seen, even in localities where their tracks and other signs are abundant. Their range covers both sides of the summit of the Sierra Nevada, and extends 12 or 15 miles west of the summit into Tuolumne Meadows, its greatest extension on the west side of the mountains. One specimen was collected by E. Heller at Mount Whitney, the extreme southern limit of the subspecies. Doctor Merriam says that he has seen signs of what he considers this hare as far north as the timberline meadows of Mount Shasta.

Total number of specimens examined 11, from:

California: Hope Valley (Alpine County), 1; Mono Lake, 10.

LEPUS AMERICANUS Group (Subgenus LEPUS).

VARYING HARES, WHITE RABBITS, AND SNOWSHOE RABBITS.

The species and subspecies included in this group are *Lepus americanus*, *L. a. struthopus*, *L. a. virginianus*, *L. a. phæonotus*, *L. a. bishopi*, *L. a. macfarlani*, *L. a. dalli*, and *L. a. columbiensis*, also *Lepus washingtoni* and *L. w. klamathensis*, with *Lepus bairdi* and *L. b. cascadensis*. They occupy a greater area than any other group of North American hares or rabbits, and yet, to the majority of people in the United States, are as little known as the Arctic hares. This is due to their distribution, which is mainly from the northern border of the United States to the northern limit of trees in Canada and Alaska. They range entirely across the continent from the Atlantic coast of New England and Canada to the Pacific coast in Washington and British Columbia and to the shore of Bering Sea in Alaska. In the United States they range south along the Allegheny Mountains to Virginia, along the Rocky Mountains to central New Mexico, and along the Cascades and Sierra Nevada to Donner, California (see fig. 8). They do not inhabit the low country between these high mountains, except along the extreme northern border of the United States. They have been introduced into the island of Newfoundland, but are not known on Vancouver and Queen Charlotte islands.

All of these hares have two annual molts and, with the exception of *L. washingtoni* and its subspecies *klamathensis*, the winter pelage is pure white in strong contrast with the buffy brown summer coat. *L. washingtoni* is nearly the same in both pelages, and *klamathensis* is sometimes the same and sometimes has the white winter coat like most other members of the group. I have provisionally recognized three species, although the large series of specimens examined indicate that when sufficient material is available from the intermediate territory, *bairdi* and *washingtoni* with their subspecies may prove to be geographic races of *Lepus americanus*. To settle this perplexing question, specimens from numerous points in the mountains of Oregon, Washington, and British Columbia are needed.

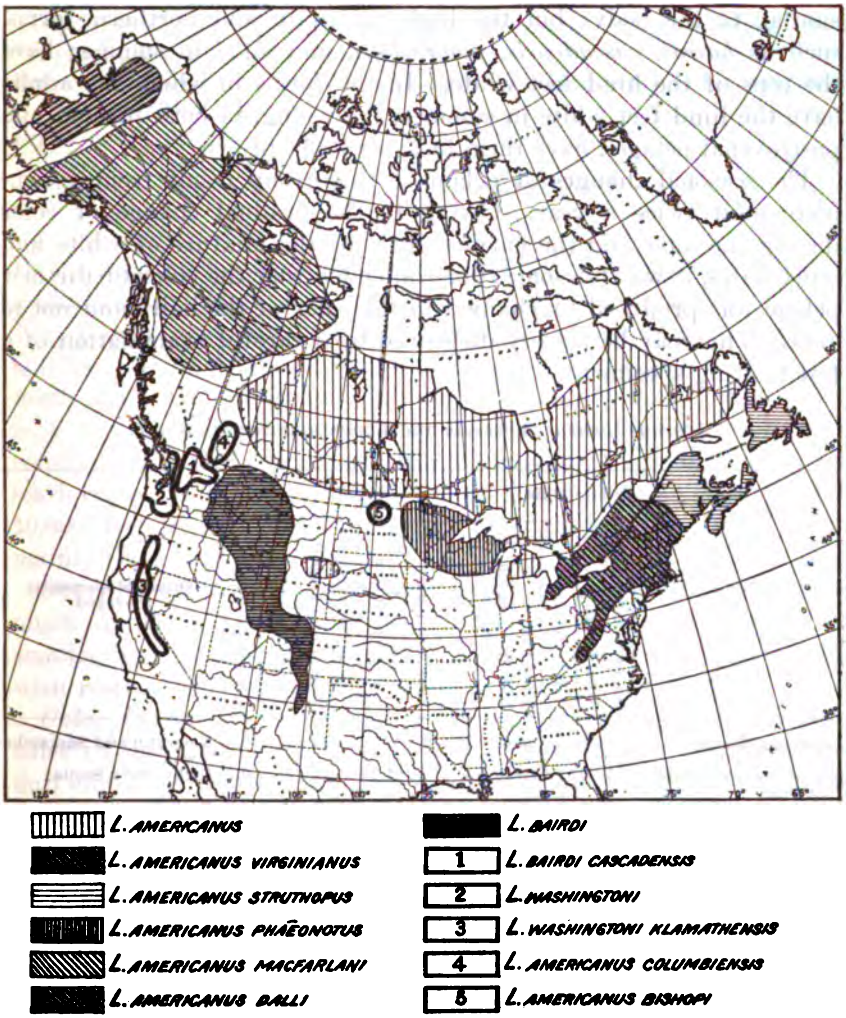

FIG. 8.—Distribution of *Lepus americanus*, *L. bairdi*, *L. washingtoni*, and allied forms.

The varying hares were the first of the American members of the Leporidæ to become known to naturalists. *Lepus americanus*, the first species named, was described from specimens collected on the shore of Hudson Bay, and for a long time was confused with the cottontails of the eastern United States.

In size and color they vary from *L. americanus virginianus*, the largest and most richly colored, to *L. washingtoni* and *klamathensis*, the smallest and among the dullest members of the group. The adults of most of the southern forms, including *virginianus*, *struthopus*, *columbiensis*, *washingtoni*, and *klamathensis*, when in the brown summer coat, have the upperside of the hind feet brownish buffy similar to the body; but the high mountain and northern forms, such as *bairdi*, *cascadensis*, *macfarlani*, and *dalli* in summer have the tops of the hind feet white. In the forms in which the adults have the hind feet white in summer, the young, in both juvenal and postjuvenal pelages, have them buffy or buffy brown.

The seasonal changes of pelage in this group result from a complete molt twice a year. Owing to the gradual change of color during the molt and the curious effect of the mixture of white and buffy hairs, it was for some time contended that the color of the new pelage was produced by changes in the color of the hairs and not to molt. This may be readily disproved by a careful examination of a few molting specimens.

Average measurements in the Lepus americanus group.

	No. of specimens averaged.	Skin.				Skull.							Origin of specimens averaged.
		Total length.	Tail vertebræ.	Hind foot.	Ear from notch, in dried skin.	Basilar length.	Length of nasals.	Breadth of rostrum above premolars.	Depth of rostrum in front of premolars.	Interorbital breadth.	Parietal breadth.	Diameter of bullæ.	
Lepus americanus	5	470	43.0	138	62.0	59.4	32.0	20.5	16.3	20.4	27.9	10.5	**Keewatin and Saskatchewan.**
Lepus americanus struthopus.	5	474	52.0	129	66.0	60.5	32.3	21.1	16.7	19.8	27.5	9.2	**Digby, Nova Scotia.**
Lepus americanus virginianus.	5	518	49.0	141	66.0	65.0	34.9	22.5	19.2	22.0	29.6	10.6	**Pennsylvania.**
Lepus americanus phæonotus.	5	464	35.4	137	62.1	59.5	31.5	21.4	16.6	20.7	28.2	10.4	**Minnesota and Manitoba.**
Lepus americanus bishopi.	1	...	....	...	....	57.5	30.0	22.0	16.5	23.0	30.2	10.2	**Turtle Mountains, North Dakota.**
Lepus americanus macfarlani.	5	489	42.0	147	67.0	62.7	33.0	20.8	16.9	20.9	28.7	10.9	**Mackenzie, Canada.**
Lepus americanus dalli	5	...	....	...	....	62.0	32.7	21.4	16.9	21.8	28.2	10.6	**Near Nulato, Alaska.**
Lepus americanus columbiensis.	5	436	41.0	135	66.0	59.7	32.1	20.1	16.3	20.0	27.5	11.3	**Central British Columbia.**
Lepus washingtoni	5	429	41.0	125	62.0	58.7	31.8	19.5	15.3	18.5	26.8	10.4	**Western Washington.**
Lepus washingtoni klamathensis.	8	414	39.0	126	64.0	55.1	27.8	18.5	14.4	17.6	26.4	9.7	**Fort Klamath, Oregon.**
Lepus bairdi	8	459	39.0	146	70.0	58.8	31.7	19.9	16.0	19.6	26.0	10.5	**Wind River Mountains, Wyoming.**
Lepus bairdi cascadensis.	5	...	....	...	69.3	59.5	32.0	19.9	16.5	19.4	27.3	10.7	**Near Hope, Cascade Mountains, British Columbia.**

LEPUS AMERICANUS Erxleben.

Varying Hare or White Rabbit.

(Pl. VI, figs. 1, 4.)

Lepus americanus Erxleben, Syst. Reg. Anim., pp. 330–331, 1777. Description based on specimens from district about Forts Severn and Churchill on western coast of Hudson Bay, Keewatin, Canada. No definite type. Fort Severn can be considered the type locality.

Lepus hudsonius Pallas, Glires, p. 30, 1778. No type nor locality mentioned, but name and context place it here.

Lepus nanus Schreber, Säugth., IV, pp. 880–885, Pl. CCXXXIVB, 1790 (in part). A composite of *Lepus americanus* and *Sylvilagus floridanus*. No type nor type locality. Range given from Hudson Bay to Florida.

Geographic distribution.—Region about southern end of Hudson Bay, including southern Keewatin; southeastern Mackenzie; most of Saskatchewan; Manitoba; east through northern Ontario (including Isle Royale and Michipicoten Island, Lake Superior); northern Quebec; all of Ungava except extreme northern part; Labrador; south in the United States in all of Michigan north of Saginaw (except western half of northern peninsula), and west in an isolated colony on the Bighorn Mountains, Wyoming. Vertical range, from sea level at Hudson Bay to about 2,000 feet near Lake Superior and 10,000 feet in the Bighorn Mountains of Wyoming; zonal range, mainly Canadian.

General characters.—Upperparts dusky grayish or grayish brown, much duller and less rusty or ochraceous than *virginianus;* size smaller and skull much smaller and more delicately proportioned, with rostrum shorter and proportionately broader at base.

Color in summer pelage.—Top of head dusky yellowish brown; sides of head, especially about eyes, a clearer shade varying from dull cinnamon buffy to dull buffy; upperparts of body varying from dusky grayish brown to dusky buffy brown; in typical specimens usually grayer and less dingy yellowish than top of head; intergrades with *virginianus* often have body nearly or quite as yellowish brown as top of head; middle of back more or less strongly washed with black, often forming an indistinct blackish band along middle; sides of body less washed with black and grayer or paler yellowish brown; rump a little more heavily washed with black than rest of back; top of tail black; underside of tail white; front of fore legs and tops of fore feet much like top of head and more rusty yellowish brown than body; outside of hind legs with a band of buffy or ochraceous buffy along front (next white underparts) and shading off into dull tawny brown; tops of hind feet dull ochraceous buffy varying to dingy white; nape dull dusky gray or dusky brown; basal half of ears on front of outside like top of head and becoming more dusky toward tip; posterior half of outside of ears grayish white becoming blackish in a broad border about tip, the black border sometimes extending entirely around tip of ears on outside; inside of ears grayish, narrowly edged all around with white; underside of neck dull cinnamon varying through various shades of buffy cinnamon; underside of head and middle of abdomen white; sides of abdomen often more or less encroached on by color of flanks; underfur in summer dull dark buffy brown, with plumbeous basal zone sometimes broader than the terminal one; underfur in winter dull dark ochraceous buffy, with a basal plumbeous zone of about equal width.

Immature pelage.—Upperparts buffy brown grizzled with gray.

Winter pelage.—Pure white, but border of ears about tip slightly dusky.

Skull.—Comparatively small and light with rostrum rather short and broad at base; braincase proportionately rather broad and rounded, but a little depressed on top; upper outline gently decurving posteriorly; frontal area immediately back of base of rostrum broad and slightly depressed; supraorbital process small, rather short, and tapering irregularly to a blunt point posteriorly, and very slightly raised above plane of frontal area; anterior notch small and shallow; posterior notches broad and deep, and skull strongly constricted and narrow between; posterior tips of postorbital processes standing well out from skull; zygomatic arch broad and heavy; middle of jugal flat, with a large open pit anteriorly; molar series heavy; bullæ small, smooth, and rounded below and in front, but flattened and overlaid posteriorly by a rough descending process of the occipital. In all the forms of this species there is a wide range in the form of the skull, especially in the basal width of the rostrum, so that only average characters can be given.

Average measurements (*5 adults*).—Total length, 470; tail vertebræ, 43; hind foot, 133; ear from notch in dried skin, 62.

Remarks.—The original description of *Lepus americanus* was based on accounts of Kalm, Barrington, and Forster. Kalm's account is a composite of the varying hare and the cottontail of the eastern United States, and may be dismissed from consideration. The accounts of Barrington and Forster were both based on reports and specimens collected by the Hudson Bay Company's employees in the districts about Fort Severn and Fort Churchill, on the southwestern coast of Hudson Bay; but Fort Severn appears to have been the main locality, and this may be considered the type locality for *americanus.* A considerable series of specimens from Pennsylvania north to the Arctic coast shows that the dusky grayish brown *americanus* from the southern Hudson Bay region increases in size and richness of color to the southward, where two forms, *virginianus* and *struthopus*, are found in the eastern part of its range. About Hudson Bay and adjacent region there is scarcely a trace of rusty or ochraceous shades on the body, but in Quebec, Ontario, and Labrador many specimens have been examined showing all degrees of intergradation in color. South of the St. Lawrence River, however, dusky gray specimens like typical *americanus* are uncommon, and when they do occur their large size and heavier skull show their identity with the local forms. Over half of the good series from Hamilton Inlet, Labrador, are typical *americanus* in color, while the others are dull ochraceous brown closely like *struthopus*.

To the northwest from the type region there is a gradual increase in size and slight darkening in color, forming the subspecies *macfarlani* of the Mackenzie and upper Yukon region.

A large series in summer pelage from Isle Royale, Lake Superior, and from the northern part of the southern peninsula of Michigan, in the Museum of the University of Michigan, are typical *americanus*, without a trace of the ochraceous shade characteristic of *virginianus*. It was most surprising to find that a series of four summer specimens from the Bighorn Mountains, Wyoming, in the Biological Survey collection, is also distinctly referable to *americanus* and not to *bairdi*. These four specimens are dusky iron gray on the body and suffused with dull buffy on the head. The gray of the body averages a little paler than in more northern specimens, though now and then equaled. Otherwise they appear to be quite typical in size, color, and skull. The latter can be matched both in size and shape by examples from Fort Chipewyan, Alberta. They have the same short and rather broad rostrum, flattened frontal region, and supraorbital processes nearly on a plane with the frontals, instead of being raised above it as in most examples of *bairdi*. The braincase is also, like typical *americanus*, broader and more flattened than in *bairdi*, but the jugals average slenderer and more as in the last form.

Total number of specimens examined 90, from:

Wyoming: Bighorn Mountains, 4.

Michigan: Butter Bridge (Oscoda County), 1; Isle Royale, 33; Luzerne (Oscoda County), 2; Marquette, 1; Saginaw County, 1.

Ontario (Canada): North Bay (Lake Nipissing), 1; Michipicoten Island, 1.

Manitoba (Canada): Dog Lake, 1; Sandy Bay, 1.

Saskatchewan (Canada): Indian Head, 2; Osler, 4.

Alberta (Canada): Edmonton, 2; 50 miles north of Edmonton, 1; Fort Chipewyan, 7; Red Deer, 1; South Edmonton, 2.

Keewatin (Canada): Oxford House, 4.

Labrador (Canada): Black Bay, 1; Hamilton Inlet, 14; Lance au Loup, 1.

Ungava (Canada): Forks, near Chimo, 4; Fort Chimo, 1.

LEPUS AMERICANUS STRUTHOPUS BANGS.

NOVA SCOTIA VARYING HARE.

Lepus americanus struthopus Bangs, Proc. Biol. Soc. Washington, XII, pp. 81–82, March 24, 1898. Type from Digby, Nova Scotia, Canada; No. 2025. ♀ ad., Museum of Comparative Zoology (Bangs collection); collected by Outram Bangs, August 4, 1894.

Geographic distribution.—Maine, east of Penobscot River, Nova Scotia, New Brunswick, eastern Quebec (south of lower St. Lawrence and including Magdalen Islands), and Newfoundland. Vertical range, from sea level up to over 2,500 feet altitude in New Brunswick; zonal range, Canadian.

General characters.—Size nearly the same as in *americanus* but ears longer; color similar to *virginianus* but duller and browner; skull smaller and slenderer.

Color in summer pelage.—Top of head and upperparts of body cinnamon brown or cinnamon buffy brown, brightest on head and darkened with a wash of blackish on back; sides of head deep cinnamon, sometimes around eyes and sides of nose almost deep dull ochraceous buffy; sides of body clearer cinnamon brown than back and often becoming rusty or slightly reddish cinnamon brown on fore feet and legs, and a duller shade of same along lower border of flanks, front of hind legs and tops of hind feet; front of ears on outside similar to top of head, but a black border near tip; inside of ears more or less cinnamon brown or rusty brown with a border of same in front and border of whitish posteriorly; top of tail blackish; underside of neck similar to sides of flanks or a little brighter more rusty cinnamon; rest of underparts white, sometimes with color of lower flanks spreading over the borders of abdomen; underfur dull dark, slightly ochraceous buffy brown underlaid with plumbeous; in winter same as *virginianus*.

Skull.—Very similar to that of *americanus*, but averaging a little larger with narrower braincase and slenderer rostrum; slightly heavier zygomatic arches and smaller bullæ. Nearer in size to *americanus* than to *virginianus*, from which it differs in smaller size, narrower rostrum, narrower postorbital process, and slenderer jugals.

Average measurements (5 adults).—Total length, 474; tail vertebræ, 52; hind foot, 129; ear from notch in dried skin, 66.

Remarks.—This rather poorly marked subspecies, an intergrade between *virginianus* and *americanus*, is typical only in Nova Scotia and adjacent parts of New Brunswick. Specimens from northern New Hampshire and western Maine are similar to *struthopus* in their small size, but are so richly colored that they must be referred to *virginianus*. Specimens from Lake Edward, Quebec, are much nearer to the present form than to *americanus*, though grading toward the latter. The single summer skin from Newfoundland is close to typical *struthopus* in color, but the two winter skins differ in having the tops of the feet and ears strongly overlaid or mixed with bright cinnamon buff; and the bright cinnamon buff of the underfur on the upperparts of head and body is so lightly overlaid with white that it shows through and tinges the color of the upperparts even in midwinter. The skulls also differ somewhat from those of typical *struthopus* in having an even slenderer rostrum. Although these animals were introduced into Newfoundland from Nova Scotia, they appear already on the way to the formation of a distinct subspecies.

A single specimen in the Carnegie Museum, an adult male in full summer pelage, taken on Grosse Isle July 1, 1901, is the only one from the Magdalen Islands seen by me. In color it is absolutely indistinguishable from typical *americanus*. The upperparts of the body are dusky iron gray, with a wash of blackish along the middle of the back and on the rump. The sides of the body are paler; the head and bases of the ears in front are like the back, but are suffused with dull ochraceous; the underside of the neck and a line along the front of the hind legs are dull, slightly rusty, ochraceous buffy. In color this specimen is almost exactly like one in the Biological Survey collection from Oxford House, Keewatin, Canada, near the type region of *americanus*. The skull, however, is that of *struthopus*, to which form it must be referred. Mr. Todd, who collected this specimen, writes that he saw many others during the same season, all similar to this, but during the summer of 1907 Mr. Osgood spent ten days on the Magdalen Islands and, aided by resident hunters, made every effort to secure more of these rabbits, without even seeing fresh signs of one. The people on the islands informed him that rabbit tracks were extremely scarce last winter; so it is apparent that the same cause which made varying hares so scarce throughout a large part of Canada in 1907 was equally effective on these islands. In July, 1907, Mr. Osgood obtained four adult topotypes of *struthopus*, and it was interesting to note that they are much less suffused with dull ochraceous, and are thus more dingy grayish brown, than the considerable series of Nova Scotia specimens of *struthopus* in the Bangs collection, including the series of topotypes. This gives rise to the question whether the general coloration of these rabbits may not, as I have suspected in the case of other species, vary in different years as the result of seasonal climatic differences.

An August specimen from the Restigouche River, New Brunswick, is bleached to a light rusty yellowish color, paler than any other example of this form seen.

Mr. James P. Howley, Director of the Geological Survey of Newfoundland, in a letter dated March 23, 1908, writes as follows concerning the introduction of *Lepus americanus struthopus* into Newfoundland and its supposed effect on the local abundance of *Lepus arcticus bangsi:* "It is now over forty years since this animal [*struthopus*] was introduced into this country from Nova Scotia. It has spread itself all over the island, and is to be found in every section of it, especially in the wooded parts. Of course this spreading was facilitated from the first by sending a few pairs into the different districts. The representatives of the districts, aided by the government, purchased a few pairs here near St. Johns, where they were first turned loose, and distributed them over their several districts.

"Undoubtedly they have driven out the large Arctic hare [*bangsi*], once fairly plentiful in most parts of the island, but now only to be found on the highest and barest uplands, which do not afford food or shelter for the rabbit [*struthopus*]. The former are now quite rare."

From Outram Bangs the writer learns that the Nova Scotia hare was introduced into Newfoundland in 1864 by the late Hon. Stephen Rendell.

Total number of specimens examined 69, from:

Maine: Bucksport, 1; Enfield, 2; Grand Lake, 2.

New Brunswick (Canada): Arthurette, 1; Forks of Tobique River (Victoria County), 3; Restigouche River, 1; Tabucintac, 3; Andover, 25.

Nova Scotia (Canada): Digby, 13; James River, 1; Kings County, 5; Shenacadie, 2.

Newfoundland (Canada): Bay of Islands, 1; Bay of St. George, 2; Rantem, 1.

Prince Edward Island (Canada): Alberton, 1.

Quebec (Canada): Lake Edward, 4; Magdalen Islands (Grosse Isle), 1.

LEPUS AMERICANUS VIRGINIANUS HARLAN.

VIRGINIA VARYING HARE.

(Pl. II, figs. 1, 2, 3.)

Lepus virginianus Harlan, Fauna Americana, pp. 196–198, 1825. Type from Blue Mountains, near Harrisburg, Pennsylvania.

Lepus wardii Schinz, Das Thierreich, IV, p. 428, 1825. Based on the varying hare of southern part of the United States (Warden, in Stat. Pol. and Hist. Account United States, I, p. 233, 1819).

Lepus borealis Schinz, Syn. Mamm., II, pp. 286–287, 1845. No type nor type locality mentioned. Distribution given as Virginia and the Alleghenies.

Geographic distribution.—Mountains of West Virginia and Virginia north through Maryland, Pennsylvania, New York, New Jersey, Delaware, Connecticut, Rhode Island, Massachusetts, Vermont, New Hampshire, most of Maine east to Penobscot River and Mount Katahdin, and extreme southern Ontario. Vertical range from near sea level in Rhode Island up to over 4,000 feet in the Adirondacks of New York; zonal range, Canadian.

General characters.—Largest, and in summer the brightest and most richly colored, form of *americanus*. Upperparts usually some shade of rusty ochraceous brown varying in a small percentage of specimens to a duller, more buffy brown. Skulls of typical specimens from Pennsylvania and south average distinctly larger and more massive than those from farther north, where they grade into the smaller *americanus* and *struthopus*.

Color of summer pelage.—Entire upperparts of head and body nearly uniform dull rusty brown or ochraceous brown, varying to buffy brown, always more or less darkened by a wash of black, heaviest on the back; legs and feet commonly clearer and brighter rusty than body, and often clear bright rusty rufous, but like ears are mingled whitish and rusty later in spring and earlier in fall than body; ears on basal half in front like head, but becoming darker brownish or even blackish on terminal half; posterior half of ears on outside whitish or gray, changing to a more or less well-marked blackish border about tip; inside grayish with grayer border in front and pure white border along posterior margin; a dusky margin sometimes present on terminal fourth of anterior border; nape similar to back but duller; rump rather more heavily washed with black than back; top of tail blackish or dusky brown, underside white or grayish; underside of neck and a narrow line along lower border of flanks and legs very rich bright dusky rufous, clearer and brighter than back, and always brighter and more rusty than upperparts, even in the duller colored specimens; rest of underparts pure white; underfur rich dark ochraceous buffy underlaid with an equal basal zone of plumbeous.

Winter pelage.—In southern part of their range sometimes pure white with a little dusky about tips of ears, but commonly with more or less dull rusty brownish on feet and terminal half of ears; the surface layer of white over back rather thinner than in *americanus;* underfur dark buffy or dull rusty ochraceous buffy underlaid with a plumbeous zone of about equal width.

Skull.—Much larger and more massive than in either *americanus* or *struthopus;* braincase more rounded and upper outline of entire skull more arched; curve over braincase more abruptly descending posteriorly; upper outline of rostrum more curved than in *americanus* and frontal area less depressed; supraorbital process similar, with the same small notch anteriorly and broad, deep notch posteriorly; posterior process varying from a heavy strap-shaped to a roughly triangular form; zygomatic arch and underparts of skull, including bullæ, proportionately about as in *americanus;* as in latter, breadth of rostrum varies greatly, and one specimen from Gold, Pennsylvania, remarkable for great breadth and massive proportions of rostrum; in some individuals upper outline of rostrum nearly straight, while more or less strongly curved in most others.

The accompanying cut of three adult skulls from Gold, Pennsylvania, shows the great amount of individual variation even in a single locality, and demonstrates the difficulty of finding definite characters for descriptive purposes. Throughout the group the skull characters available are merely averages, subject to much variation individually as well as locally.

Average measurements (*5 adults*).—Total length, 518; tail vertebræ, 49; hind foot, 141; ear from notch in dried skin, 66.

Remarks.—This is the brightest colored and most rufous of all the subspecies of *americanus*, but there is great variation in the exact shade, and some are much duller and more buffy brown than others. The material in summer pelage at hand from the southern part of its range is scanty, but appears to be quite uniform with the large series from central New York. The change of coat from summer to winter, or the reverse, furnishes much curious variation, some of which little resembles either of the full pelages. Specimens collected near Ossipee, central New Hampshire, the last of September, are still in full summer pelage, but in others collected the middle of October the feet and ears are nearly white.

A few faded specimens in summer coat from central New York are dull buffy brown almost like *phæonotus* and in marked contrast with the great majority of the large series of richer and darker specimens from that vicinity. Specimens from the central part of New Hampshire and from various points in Maine as far east as the Penobscot River and Mount Katahdin are nearly all bright ochraceous rusty on the feet and upperparts, and thus must be classed with *virginianus*, although the skulls are small and slender, closely like typical *struthopus*. A number of specimens from this intergrading region are dull colored like *struthopus*, just as a few specimens among the large series from northern New York are colored like *americanus*.

Total number of specimens examined 146, from:

West Virginia: Travelers Repose, 1.
Maryland: Cumberland, 1.
Pennsylvania: Austin, 2; Bell Landing, 3; Southern part Bradford County, 2; Center County, 1; Erie, 1; Gold, 4; Gouldsboro, 4; Lopez, 3; Montrose, 1; Pabst Mountain (Lycoming County), 1.
New York: Big Moose Lake, 1; Catskill Mountains, 2; Elizabeth, 1; Elizabethtown, 1; Lake George, 7; Locust Grove, 2; Lyonsdale, 1; Owego, 1; Peterboro, 1; Piseco, 11; Spruce Lake (Hamilton County), 14; T Lake (Hamilton County), 1.
Rhode Island: Exeter, 1; Washington County, 9.
Massachusetts: Concord, 1; Lunenburg, 7; Middleboro, 3.
Vermont: Hartland, 10; Rutland, 10; Sherburne, 1.

New Hampshire: Ossipee, 14; Webster, 2.

Maine: Bethel, 1; Greenville, 8; King and Bartlett Lake (60 miles south of Rangeley Lakes), 2; Mount Katahdin, 1; Sandy Stream Pond, 2; Sebec Lake, 1; Upton, 2.

Ontario (Canada): Bobcaygeon, 2; Mount Forest (east of Lake Huron), 2.

LEPUS AMERICANUS PHÆONOTUS ALLEN.

MINNESOTA VARYING HARE.

Lepus americanus phæonotus Allen, Bull. Am. Mus. Nat. Hist., N. Y., XII, Art. II, p. 11, March 4, 1899. Type from Hallock, Kittson County, Minnesota; No. $\frac{4481}{3305}$, ♂ ad., American Museum of Natural History; collected by E. A. Mearns, November 17, 1891 (in changing pelage).

Geographic distribution.—Western half of northern peninsula of Michigan, northern Wisconsin, northern Minnesota, and north into extreme western Ontario, and southern Manitoba. Vertical range from about 900 to 2,000 feet in northern peninsula of Michigan; zonal range, Canadian.

General characters.—Size of typical *americanus*, but in summer paler and more buffy; more like *columbiensis* in the light buffy color, but darker, less yellowish, and often tinged slightly with dull reddish.

Color in summer pelage.—Top of head and back dull buffy, varying to pale dull ochraceous buffy brown, darkest on head, and top of back only slightly darker than sides of body; rump slightly more washed with black than back; top of tail mixed black and dingy white (sometimes more or less buffy, as in type), giving a dusky grayish or buffy gray color; below white; sides of head, especially about eyes and back to base of ears, richer, clearer, and more ochraceous buffy than back; tops of fore feet and fore legs similar to head, but deeper rusty ochraceous buffy, finely grizzled and darkened with dusky; tops of hind feet white in all specimens seen; front of ears like top of head on basal half, becoming darker toward tip, where bordered with black; posterior half whitish with a broad black margin; inside of ears grayish, with dull ochraceous buffy margin in front and white margin posteriorly; underside of neck varies from dark fulvous buffy to rusty cinnamon and deep rich cinnamon rufous; rest of underparts bright white, except where color of sides sometimes encroaches on sides of abdomen; underfur in summer nearly as in *americanus*, but averaging lighter buffy brownish, sometimes becoming more or less tinged with cinnamon on top, with the same basal zone of rather dark plumbeous.

Winter pelage.—Entirely pure white except a well-marked blackish border about tips of ears and sometimes more or less brownish buffy on front of same; underfur tipped with a broad band of dark rusty ochraceous varying to rich cinnamon, similar to *virginianus*.

with a basal zone of plumbeous; the ochraceous buffy surface of underfur overlaid by such a thin outer coat of white that it shows through strongly whenever the overlying white is even slightly disarranged.

Immature pelage.—General color dull buffy brownish, thinly grizzled with gray.

Skull.—Small and rather light; scarcely distinguishable from that of typical *americanus*, but rostrum averaging a little broader and heavier and braincase slightly broader; the same small supraorbitals with deep, narrow, well-marked, slit-like anterior notch and rather short, irregular postorbital process.

Average measurements (5 adults).—Total length, 464; tail vertebræ, 35.4; hind foot, 137; ear from notch in dried skin, 62.

Remarks.—The present form, while strikingly different from *virginianus* in its pale, dull colors, is far less distinct from *americanus*, though distinctly paler in the southern part of its range. Specimens from the southern part of its range in Minnesota are palest and most strongly marked, while those from the type locality to the north are darker and browner and intergrade with *americanus*. It is purely a color form, and there appear to be no distinctive skull or other characters to separate it from *americanus*. Its range is extremely restricted, and more material is needed to show its relationship with *bishopi*.

The type is a young adult in mixed pelage changing from summer to winter coat, with feet, ears, rump, and lower flanks nearly all white. The rest of the back is dark rusty cinnamon brown like several Manitoba specimens. The type skull, that of a young of the year, is much smaller and lighter than average adult skulls of this form. Specimens from the Porcupine Mountains and elsewhere in the western half of the northern peninsula of Michigan show gradation toward *americanus*, but are referable to *phæonotus*. A summer adult from Red River Settlement (=Winnipeg) has the color of *americanus*, but the prevailing form along the southern border of Manitoba is *phæonotus*.

Total number of specimens examined 66, from:

Michigan: Houghton, 1; Porcupine Mountains (Ontonagon County), 2; Pine Lake (Marquette County), 1.

Wisconsin: Eagle River, 5; Fisher Lake (Iron County), 1; Rhinelander, 5; St. Croix River (Douglas County), 1.

Minnesota: Argyle, 1; Bridgman, 1; Elk River, 21; Hallock (Kittson County), 3; Hinckley, 1; Moores Lake (Todd County), 3; Mora (Kanabec County), 1; St. Vincent, 2; Warren, 1.

Ontario (Canada): Rainy Lake, 1; Rat Portage (Lake of the Woods), 4.

Manitoba (Canada): Carberry, 5; Red River Settlement, 2; Selkirk Settlement, 4.

LEPUS AMERICANUS BISHOPI ALLEN.

TURTLE MOUNTAIN SNOWSHOE RABBIT.

Lepus bishopi **Allen, Bull. Am. Mus. Nat. Hist., N. Y., XII, Art. II, pp. 11–12, March 4, 1899. Type from Mill Lake, Turtle Mountains, North Dakota; No. $\frac{10790}{9084}$, ♂ ad., American Museum of Natural History; collected by Dr. L. B. Bishop, July 12, 1895.**

Geographic distribution.—Known only from type locality, Turtle Mountains, North Dakota.

General characters.—(The type, in extremely worn summer pelage.) Upperparts dark, dull, grayish buffy brown with more or less dull ochraceous about head, back, and legs; a narrow dusky dorsal line; skull remarkably short and broad.

Color of the type (and only known specimen, in extremely worn summer pelage).—Head dull slightly ochraceous rusty brown, becoming much paler and more of a dull ochraceous buffy from sides of nose through orbital region to base of ears; top of head darkest and same color extending halfway up front of ears; latter becoming blackish on terminal third and edged all around with whitish; top of back similar to top of head, but duller colored and more or less clouded or mingled with dull rusty ochraceous buff and with a narrow median band of blackish; sides of body and rump more of a dull grayish brown slightly tinged with dull buffy; tops of fore feet and fore legs similar to top of head but a deeper dark rusty ochraceous buff; outside of hind legs similar to sides of body but strongly washed on outside and in front with ochraceous buffy; tops of hind toes rusty ochraceous and rest of feet whitish mixed with same; upperside of tail dusky brown; underside white; underside of neck dark cinnamon brown; rest of underparts pure white; underfur dark slightly buffy grayish brown on surface and dark plumbeous at base.

Skull.—Proportionately the shortest and broadest (especially across the braincase) of any member of the *americanus* group; rostrum short and broad; frontal area much more strongly depressed than in *phæonotus* or *americanus;* braincase full and rounded and extraordinarily broad; supraorbitals short and broad with well-marked anterior notch and short broad postorbital process standing out widely from skull; jugals broad and heavy with a deep flat groove anteriorly; posterior end of incisive foramina broadest with an angular form to outer posterior corner, as not infrequently seen in specimens of *bairdi;* molar series small; bullæ about as in *americanus.*

Remarks.—The type and only known specimen of this form is an adult in such badly worn summer pelage that the long outer hairs have practically disappeared, leaving the dark woolly underfur exposed. The general color and such traces of the long hairs as remain indicate a dark, dull colored animal somewhat like dull brownish specimens of typical *americanus*. The skull, however, is remarkable for its short broad form so different from any of the other members of the *americanus* group that it appears advisable for the present to recognize *bishopi*. The type, even though so badly worn, is so dark that apparently it is quite a differently colored animal from *phæonotus*. The grayish buffy brown of the underfur is more like *americanus*, but the traces of the surface shades left on head, back, feet, and legs indicate that in full summer pelage *bishopi* may be more dark rusty ochraceous than any of the forms mentioned. Further material from Turtle Mountains may show this to be a good form or, what is still more probable, may prove that the peculiarities of the type are due to individual variation, and that the hares from these mountains are true *americanus*. This is rendered more probable by the discovery that the animals from the Bighorn Mountains of Wyoming are not separable from *americanus* of Canada.

Total number of specimens examined 1, from:

North Dakota: Turtle Mountains, 1.

LEPUS AMERICANUS MACFARLANI MERRIAM.

MACKENZIE VARYING HARE.

Lepus americanus macfarlani Merriam, Proc. Washington Acad. Sci., II, p. 30, March 14, 1900. Type from Fort Anderson, north of Great Bear Lake, Mackenzie, Canada; No. 14467, ad. (skull only), U. S. National Museum; collected by R. MacFarlane, March, 1863.

Lepus saliens Osgood, N. Am. Fauna No. 19, pp. 39–40, October 6, 1900. Type from Caribou Crossing, Yukon River, between Lakes Bennett and Tagish; No. 98956, ♂ ad., U. S. National Museum (Biological Survey collection); collected by W. H. Osgood, June 26, 1899.

Geographic distribution.—Wooded parts of Alaska, in Upper Yukon region, and southwest to Cook Inlet; base of Alaska Peninsula and all of Yukon Territory, western Mackenzie, northern British Columbia, and northwestern Alberta, Canada. Its northern limit coincides with that of the trees. Vertical range, in the Mackenzie River region, from near sea level up to over 2,000 feet altitude; zonal range mainly Hudsonian.

General characters.—Most like typical *americanus* but darker; the darkest and most dusky gray form of this species; upperparts of body dusky brownish gray varying to dusky fulvous; head similar but strongly suffused on sides with dark ochraceous buff; rump blackish; top of tail black. Size averaging distinctly larger and ears longer than *americanus*.

Color in summer pelage.—Top of back dark brownish gray, varying from nearly dark iron gray to dusky cinnamon or dusky buff, with an overlying black wash, heaviest along middle, and often forming a blackish median band; rump more blackish than top of back, often nearly black; upper side of tail black; sides of body less heavily washed with black and paler than back; head usually more or less strongly suffused with dark ochraceous buffy, becoming clearest about eyes and grayish on sides of nose; front of ears on basal half like top of head, shading into blackish on terminal half; posterior half of outside of ears grayish white with a broad blackish band next the narrow pure white posterior edging; inside of ears dusky brownish, becoming darkest on posterior part and bordered with grayish in front and white posteriorly; front feet and legs and hind feet and lower hind legs pure white; underside of neck varies from deep rich fawn color to dull dark cinnamon and dull grayish buffy; color of flanks encroaching on sides of abdomen in some specimens but otherwise rest of underparts pure white; underfur dull ochraceous buffy underlaid with an equal zone of plumbeous.

Postjuvenal pelage (*young of the year*).—Upperparts usually a shade of dull buffy brown, always with much less black on back and rump than in adults, giving the back and sides of body a nearly uniform color; tops of fore and hind feet and legs always dark colored, varying from rusty cinnamon or rusty ochraceous to dull dark buffy.

Winter pelage.—Pure white, except a narrow dusky margin about tips of ears; underfur in winter dingy ochraceous buff as in *americanus;* overlying white coat heavier than in *virginianus.*

Skull.—Closely like that of typical *americanus*, but averaging larger with usually larger bullæ and jugals.

Average measurements (*5 adults*).—Total length, 489; tail vertebræ, 42; hind foot, 147; ear from notch in dried skin, 67.

Remarks.—This is a poorly marked subspecies distinguished only by its larger size and rather darker colors. There is the usual wide range of individual variation in the summer pelage, some specimens being dark iron gray while others are dark cinnamon buffy, but the prevailing duskiness is an average character separating this from the other forms. One specimen from Fort Anderson, Mackenzie, is not distinguishable in color from a *Lepus bairdi* from Mullan, Idaho, except for the larger amount of white on the legs and of gray about the bases of the ears. Other specimens from Alaska and Yukon Territory are scarcely distinguishable in color from summer specimens of *bairdi* from the type region in Wyoming, but may be separated by their skull characters.

The considerable series of summer specimens from the upper Yukon and its tributaries (representing *saliens*) average a little larger than those from either the type region of *dalli* or *macfarlani* with no color differences to separate them from *macfarlani* so far as the series from the type region of the latter show. After careful consideration of the present material it appears best to recognize both *macfarlani* and *dalli*, though the former is a poorly marked form characterized mainly by its slightly darker color and larger size. *Macfarlani* reaches its greatest development about the headwaters of the Yukon, whence come the largest specimens examined.

A small series of summer skins from Tyonek, Cook Inlet, Alaska, are similar to those from the Yukon and Mackenzie rivers.

Four summer specimens in postjuvenal pelage from Lake Clark, only a short distance from Cook Inlet, have the body dusky brownish gray with a dingy rusty yellowish tinge, the tops of the fore feet and legs dark rusty cinnamon and the tops of the hind feet a slightly lighter shade of the same. There are no marked skull characters in the specimens from Lake Clark, but the rostrum appears to be more slender and the supraorbitals rather smaller than typical *macfarlani* and more like *dalli*, and it is possible they may represent the latter form. Specimens from Fort Resolution and Fort Rae, on Great Slave Lake, Mackenzie, are intermediates between *americanus* and *macfarlani*.

Total number of specimens examined 345, from:

Mackenzie (Canada): Fort Anderson, 4; Fort Franklin, 5; Fort Laird, 7; Fort Providence, 1; Fort Rae, 5; Fort Resolution, 4; Fort Simpson, 43; Fort Smith, 2; Great Bear Lake, 1; Mount Charles (Great Bear River), 9; Nahanni, 1; Old Fort Good Hope, 3; Peel River, 1.

Yukon (Canada): Caribou Crossing, 1; Fort Selkirk, 6; Forty Mile, 2; Lake Le Barge, 1; La Pierre House, 1; Macmillan River, 4; Pelly River, 189; Russell Mountains, 1; Thirty Mile River (15 miles north of lower Lake Le Barge), 2.

British Columbia (Canada): Bennett, 4.

Alaska: Mouth of Charlie Creek, 4; Circle, 2; Tyonek (Cook Inlet), 6; 15 miles below Eagle, 1; Fort Yukon, 5; Lake Clark, 17; head of Seward Creek (near Eagle), 7; Mount McKinley (north base), 4; Sheep Creek, 2; mouth of Porcupine River, 2.

LEPUS AMERICANUS DALLI MERRIAM.

ALASKA VARYING HARE.

Lepus americanus dalli Merriam, Proc. Washington Acad. Sci., II, pp. 29–30, March 14, 1900. Type from Nulato, Alaska; No. $\frac{8996}{7579}$, ♂ ad. (skull only), U. S. National Museum; collected by W. H. Dall, January 27, 1867.

Geographic distribution.—Wooded parts of western Alaska from below Fort Yukon to coast of Bering Sea at mouth of Yukon, and from Bristol Bay north to tree limit. Vertical range from near sea level on lower Yukon up to about 2,000 feet on adjacent mountains; zonal range mainly Hudsonian.

General characters.—Size about as in *macfarlani*, from which it differs strikingly in its ochraceous buffy summer pelage and the more pointed and rounded rostrum.

Color in summer pelage.—Upperparts of head and body dark ochraceous buffy, darkened on top of back and paler and brighter on sides of head and neck; upperparts grizzled with grayish buffy; underside of neck nearly clear dull ochraceous buffy; rest of underparts with fore and hind feet white; underfur on top of back tipped with a thin zone of dusky brownish, underlaid with a stronger and broader zone of dark ochraceous buffy followed by a broad basal zone of plumbeous; the ochaceous buffy zone of underfur gives the prevailing tone to upperparts.

Postjuvenal pelage, from Yukon Delta (September, 1880).—Top of back dark ochraceous buffy thinly washed with black, becoming paler and clearer ochraceous buffy on sides of body; rump and outside of hind legs a little more dusky; top of head a little more rusty than back and grizzled with grayish buffy; sides of nose, orbital area, and thence back to base of ears cinnamon buffy, pale on sides of nose and darker and richer about eyes; underside of neck, lower shoulders, and front of fore legs bright rusty ochraceous, shading into paler and duller buffy on tops of fore feet; tops of hind feet dull slightly rusty buffy; rest of underparts white; top of tail blackish, underside grayish white; front of ears similar to top of head, edged with dusky about tip; behind whitish with dusky border near tip; inside of ears pale buffy grayish, edged with deep rusty buffy in front and pure white behind.

Winter pelage.—Pure white, except a dusky border to tips of ears; underfur varies from dull cinnamon to a dark slightly brownish shade of same, as in many specimens of *macfarlani* and *virginianus*.

Skull.—In general dimensions about as in *macfarlani* from the central Mackenzie and upper Yukon regions; rostrum about the same at base but tapering much more rapidly to a narrow, rounded muzzle, giving a sharply pointed form contrasting with the broader and more flattened muzzles of *macfarlani;* supraorbitals the same with well-marked notch in front and rather short, blunt, outstanding process behind; jugal heavy and bullæ rather large.

Remarks.—Only two skins of *dalli* in summer pelage have been examined; one of them from near the type locality appears to be a young adult, but is in bad condition. The other is a partly grown young in its postjuvenal pelage, and is closely similar in color to the older skin except for a slightly richer shade of ochraceous. These two skins from widely separated localities agree in possessing the most ochraceous buffy color among the very large number of specimens of this group examined; they appear to prove that, so far as color goes, *dalli* is one of the most strongly marked forms of *americanus.* The contrast between the dusky gray, or brownish gray, of *macfarlani* and *americanus* and the rich ochraceous buffy of *dalli* is striking. The skull characters are less well marked, though the differences in the rostrum are fairly constant. The exact limits of the ranges of *dalli*, *macfarlani*, and *americanus* can be worked out satisfactorily only by the use of summer material, as there are no positive skull characters. The skulls from the region about the type locality of *macfarlani* are more like those of *dalli* than are those from the upper Yukon and Mackenzie River region.

The total number of specimens examined 12 from:

Alaska: Anvik, 3; Kokoyukuk, 1; Koyukuk, 3; Nulato, 4; Yukon Delta, 1.

LEPUS AMERICANUS COLUMBIENSIS RHOADS.

BRITISH COLUMBIA SNOWSHOE RABBIT.

Lepus americanus columbiensis Rhoads, Proc. Acad. Nat. Sci., Philadelphia, June, 1895, pp. 242–243. Type from Vernon, British Columbia; No. 7462, ♀ ad., Philadelphia Academy of Sciences (Rhoads collection); collected by S. N. Rhoads, July 29, 1892.

Geographic distribution.—Rocky Mountain region of southeastern British Columbia (except extreme southeastern corner) and western Alberta, Canada (from Vernon, British Columbia, to Jasper House, Alberta). Vertical and zonal ranges not definitely known.

General characters.—Size small, about as in *washingtoni*, with ears and hind feet longer; color in summer usually dingy yellowish buffy darkened by a thin wash of blackish; head, underside of neck, and tops of feet reddish or rusty cinnamon; hairy pads on underside of toes, in full summer pelage, dingy whitish, contrasting with dull smoky brown on soles of hind feet, the contrast less marked than in *washingtoni.*

Color in summer pelage.—Upperparts of body in typical specimens dingy yellowish buffy; back with an overlying thin black wash; sides of body without black wash and paler and clearer buffy than back; rump slightly more heavily washed with black than rest of back; top of tail blackish, underside dingy whitish gray; top and sides of head with tops of fore feet and legs deep dull cinnamon or rusty buffy, darkened by mixture of dusky on crown and tops of feet and legs, clearest about eyes and sides of nose; underside of neck usually similar to sides of head, but brighter and richer and varying from dark buffy to rich rusty cinnamon; tops of hind feet and front border of thighs dull rusty buffy, sometimes approaching color of fore legs; underside of head and body pure white, except along sides of abdomen, over which color of flanks often mixes with or overlies the white; anterior half of outside of ears similar to or sometimes a little darker than crown; ears sometimes nearly uniform to tip, but usually becoming darker on terminal half with a narrow black margin about tip; posterior half of outside of ears grayish white with a well-marked black tip, sometimes about half an inch broad; inside of ears usually whitish with a white border all around, and sometimes a mixture of buffy brown along posterior side; nape similar to back but more dusky and not grizzled; in specimens not too worn and stained the hairy pads on underside of hind toes show distinctly whitish, contrasting with the more dusky soles of hind feet, though this character is far less pronounced than in *washingtoni* and is evidently intermediate between latter and the uniform color of these parts in *phæonotus;* underfur with terminal zone varying from dull buffy brown to dull ochraceous buffy; basal zone of about equal width plumbeous.

Juvenal pelage.—(Field, British Columbia, August 27, 1892.) Top of head and back dingy buffy brown grizzled with buffy gray; sides of body paler and much less grizzled, becoming grayer buffy on flanks and brighter, more fulvous buffy on sides of neck and outside of hind legs; sides of head, from sides of nose back around eyes and cheeks to inside of ears, clearer and more of a deep dull ochraceous buffy; outside of ears a little duller ochraceous buffy brown margined with white; tops of hind feet whitish; soles of hind feet dusky, contrasting with whitish soles of toes.

Winter pelage.—Not seen.

Skull.—In typical specimens much like that of *washingtoni*, but slightly larger, with rostrum similarly long and slender; braincase narrow and rounded; supraorbital process light with narrow and often almost rod-like posterior process; anterior part of supraorbital broader with a more strongly marked notch; jugals proportionately about the same; bullæ slightly larger and more irregularly roughened on underside; molar series the same; incisive foramina varying between the subtriangular form of *americanus* (with its broadest part at posterior end) to the form characteristic of *washingtoni* with the foramina gradually broadening to near middle and then decreasing slightly to the posterior end; specimens from Shuswap, British Columbia show both forms of incisive foramina.

Average measurements (5 adults).—Total length, 436; tail vertebræ, 41; hind foot, 135; ear from notch in dried skin, 66.

Remarks.—The material at hand shows that *columbiensis* is a well-marked subspecies with much similarity to *washingtoni* in the form of skull, but no material is at hand proving direct intergradation. Its range covers a comparatively limited area in the Rocky Mountains of southeastern British Columbia and across the adjacent border into western Alberta. Specimens from the type district west of the main divide in British Columbia, and from Jasper House and Fiddle Creek on the east side of the mountains in Alberta, are practically alike in the curious dingy yellowish color of the body, which is the most distinctive character of this form. Specimens from about the type locality are distinctly smaller than those from Jasper House and Fiddle Creek east of the mountains, and their skulls are lighter with smaller supraorbitals, narrower jugals, smaller teeth, and with the incisive foramina smaller and more as in *washingtoni.* In fact, while specimens from both sides of the mountains agree closely in color, the series west of the range are nearer *washingtoni* in size and skull characters, while the series from east of the mountains (Jasper House and Fiddle Creek) approach the much larger *macfarlani* in these characters. Every specimen from east of the mountains examined has the posterior end of the incisive foramina broadest, while only about half of the series from west of the mountains exhibits this character, the others being like *washingtoni.* As already stated, the most marked character of *columbiensis* is the prevailing dingy yellowish color of the body, with the richer, dull cinnamon buffy of the head and feet. A large proportion of the series from both British Columbia and Alberta agree in this, but there is considerable variation among the remaining specimens. A nearly grown young of the year from Jasper House, Alberta, is nearly uniform dull reddish brown over the head and body, with the sides of the head and underside of the neck a little clearer and brighter shade of the same. This is the main case of individual variation in color among a series of 14 specimens which otherwise are remarkably uniform. The Alberta specimens were taken the first half of October and have white feet and ears. September specimens from British Columbia still have rusty colored feet, though some white hairs are appearing. The lack of reddish and the generally slightly paler tone of color, compared with that of most other forms of *americanus*, at once suggests *phæonotus*, its nearest neighbor to the east, to which, although readily distinguishable, it has a closer superficial resemblance than to any other. The limits of *columbiensis*, where it grades into *macfarlani* on the north and gives way to *klamathensis* and *cascadensis* on the south, are still unknown. From the resemblance between the skulls of *columbiensis* and *cascadensis*, as well as other characters, it appears altogether likely that they intergrade with one another as well as with *washingtoni*, but more material from intermediate areas is necessary to determine this question.

Total number of specimens examined 15, from:

British Columbia (Canada): Field, 1; Shuswap, 7; Vernon, 1.
Alberta (Canada): Fiddle Creek, 3; Jasper House, 3.

LEPUS WASHINGTONI BAIRD.

WASHINGTON VARYING HARE.

(Pl. VI, figs. 2, 5.)

Lepus washingtoni Baird, Proc. Acad. Nat. Sci. Philadelphia, 1855, p. 333. Type from Fort Steilacoom, Washington; No. $\frac{1323}{280}$, ad., U. S. National Museum; collected by Dr. George Suckley.

Geographic distribution.—Washington and north to Fraser River, British Columbia, from the western slope of the Cascade Mountains to the sea (including the Olympic Mountains). Vertical range from sea level to about 3,500 feet on the west slope of the Cascades; zonal range mainly Transition and Canadian.

General characters.—Size small, ears and feet short; upperparts dull dark reddish brown, with tops of feet a brighter and more intense shade of same; soles of hind feet smoky blackish, sharply contrasting with the whitish soles of the toes; underside of tail gray or dull buffy; two annual molts.

Color in summer and winter pelage.—Upperparts dull dark slightly reddish cinnamon brown, darkest on top of head and back, where washed with black, paler and clearer on sides of body; sides of nose, area about eyes, and back to base of ears sometimes nearly like sides of body but usually a brighter, more cinnamon rufous shade; tops of fore and hind feet richer and darker cinnamon rufous than sides of head and finely grizzled with black; outside of fore and hind legs similar to sides of body; rump like rest of back; nape dull rusty; outside of ears in front like top of head but becoming darker on terminal half; outside of ears behind bright rusty or rusty whitish, with a broad terminal black band extending as a narrower band over tip in front; inside of ear whitish with a brown band posteriorly; edged anteriorly with same color as orbital area and posteriorly with white; top of tail black; underside of tail varying from dingy gray to dull cinnamon or rusty buff; underside of neck similar to sides of body, sometimes becoming brighter like sides of head; rest of underparts, including a narrow line along back of fore legs and front of hind legs and inner border of hind feet, clear bright white, except where color of flanks sometimes encroaches on sides of abdomen; underfur with a terminal zone of dull buffy brown, sometimes becoming more or less ochraceous, and a basal zone of plumbeous.

Winter pelage of typical *washingtoni* similar to summer pelage, except for a slightly paler more vinaceous cinnamon tinge to the upperparts.

Postjuvenal pelage.—Similar to old adults, but upperparts darker and more deeply reddish brown; underparts of body and inside of legs dingy white, washed with dull rusty; underside of feet and toes as in adults.

Juvenal pelage.—Color the same as in postjuvenal pelage, but pelage more woolly.

Skull.—Small and proportionately narrow and slender; braincase narrow and more rounded than in the larger forms of *americanus;* rostrum proportionately long and slender with long, narrow nasals; frontal area slightly depressed and supraorbital breadth very narrow; supraorbitals slightly raised above plane of frontal area, narrowing from back to front, thus decreasing width of anterior border until anterior notch becomes obsolete or represented by a broad and shallow concavity; posterior process small and slender, slightly tapering or rod-like, posterior tip often nearly touching skull and inclosing a large flattened oval notch; zygomatic arch narrow and slender with a shallow groove and shallow open pit anteriorly; molar series small and light; bullæ proportionately large and rounded below; palatal bridge proportionately broad with a sharp point in the middle of posterior border; incisive foramina broadest in middle and slightly decreasing in width to the doubly rounded posterior end.

Average measurements (5 adults).—Total length, 429; tail vertebræ, 41; hind foot, 125; ear from notch in dried skin, 62.

Remarks.—The series of over forty specimens of typical *washingtoni* examined, taken at all seasons of the year, shows remarkable uniformity of color and no trace of a change into a white winter coat. An immature specimen taken at 3,500 feet altitude on the west slope of Mount Rainier is indistinguishable from one of the same age from the coast of Neah Bay; so it is evident that typical *washingtoni* ranges up some distance on the west slope of the Cascades. The most surprising changes in distribution among the members of this group of rabbits appear to take place in British Columbia. At Chilliwack typical *washingtoni* (which does not change to a white winter coat) is found, while only a comparatively short distance up Fraser River, at Hope, occurs a distinct form, *cascadensis*, characterized by its darker colors, which changes to a white winter coat. Only a little to the east of this there is another abrupt change to *columbiensis.* The skulls of these three forms show close relationship, and it would be an interesting piece of work for some one to secure specimens from the intervening areas to determine whether there is or is not direct intergradation in color. It appears entirely probable that they will all prove to be subspecies of the same thing.

The southern limit of *washingtoni*, where it intergrades with *klamathensis*, is still to be determined. The slender rostrum, supraorbitals narrowing anteriorly, and the incisive foramina narrowing posteriorly, are strong characters of *washingtoni*, all of which appear irregularly and in a modified degree in the adjacent forms, and thus evidence their close relationship. Of the forty specimens of *washingtoni* examined, in all but five the soles of the hind feet are black, in strong contrast with the white soles of the hind toes. The uniformity of the color on the underside of the feet and toes of the remaining five was evidently due to staining. This character appears almost as strongly marked in *klamathensis*, and to a much less degree in *columbiensis* and *cascadensis*.

Total number of specimens examined 57, from:

Washington: Avon, 1; Baker Lake, 1; Boulder Lake, 1; Chehalis County, 1; Chilomensk Depot, 1; Granville, 3; La Push, 1; Mount Rainier, 1; Mount Vernon, 9; Neah Bay, 5; Nisqually Flats, 3; Quiniault Lake, 2; Shoalwater Bay, 1; Steilacoom, 4; Trout Lake, 1; White Salmon, 1.

British Columbia (Canada): Chilliwack, 3; Douglas, 3; Hastings, 1; Mount Lehman, 2; Sumas, 12.

LEPUS WASHINGTONI KLAMATHENSIS MERRIAM.

OREGON SNOWSHOE RABBIT.

Lepus klamathensis Merriam, N. A. Fauna No. 16, pp. 100–101, October 28, 1899. Type from head of Wood River, near Fort Klamath, Oregon, No. 92248 ♀ ad., U. S. National Museum (Biological Survey collection); collected by B. L. Cunningham, January 25, 1898.

Geographic distribution.—Cascade Mountains and adjacent parts of Oregon and higher parts of Sierra Nevada of eastern California south at least to Pacific, Eldorado County. Vertical range from about 4,000 feet in mountains near Fort Klamath up probably to timberline; zonal range, mainly Canadian.

General characters.—Size about as in *washingtoni*; color most like the latter, but paler and more of a vinaceous cinnamon.

Color in brown winter pelage.—Most like *washingtoni*, but distinctly paler; upperparts of head and body dull vinaceous cinnamon, usually slightly darker on top of back (in one specimen strongly washed with black) and paler on sides of body; orbital area richer and brighter or more pinkish buffy than top of head, sometimes with an ochraceous tinge; rump rather paler than rest of back; top of tail dull brownish buffy with a narrow median black area; underside dull pale buffy whitish; front half of outside of ears similar to top of head, but a little darker and becoming much darker near tip, where strongly bordered with black; posterior half of outside of ears dull buffy or buffy gray at base and tipped with a broad black patch as in *washingtoni;* inside of ears dull whitish, with a brown band near posterior side and edged along front and below black tip with deep ochraceous buffy, and on posterior border with pure white; tops of fore feet and legs and tops of hind feet darker and more rusty reddish than body, with a fine grizzling of blackish, the rusty reddish sometimes extending out over adjacent part of lower shoulders and along lower side of flanks; outside of hind legs like flanks; tops of hind feet and fore toes more or less irregularly marked and blotched with white; underside of fore legs and front border of thighs with a narrow pure white band; underside of neck brighter and more intensely colored than flanks and usually more rusty reddish; rest of underparts pure white; soles of hind feet dusky, contrasting with whitish underside of toes, but not so strongly as in *washingtoni;* underfur with a narrow terminal zone of dingy buffy, and a much broader basal zone of plumbeous.

The foregoing description is based on three adults in perfect brown coat, taken near Fort Klamath between December 29 and January 25. Five other specimens, labeled from the same place, taken in November, December, January, and April, vary from mixed white and brown of the changing pelage in November to the pure white winter pelage of later dates, except that the outside of the ears in front are rusty buffy and the posterior tips are blackish. The outer zone on the underfur varies in these specimens from pale salmon buffy to dull salmon, with an underlying zone of plumbeous, varying in intensity with outer zone.

Skull.—Similar to *washingtoni*, but even smaller and slenderer; rostrum averaging narrower and slenderer; braincase narrow and rounded; supraorbital processes narrowing anteriorly until anterior notch becomes obsolete in some specimens as in *washingtoni*, but in others the notch is more distinctly marked; postorbital process even longer and slenderer or more rod-like, almost touching skull posteriorly and inclosing a wide flattened oval notch; zygomatic arch about the same; molar series the same; palatal bridge narrower, with posterior border nearly plane; incisive foramina broadest in middle and narrowing posteriorly in about half the specimens as in *washingtoni*, and subtriangular and broadest at posterior end in the others.

Average measurements (*3 adults*).—Total length, 414; tail vertebræ, 39; hind foot, 126; ear from notch in dried skin, 64.

Remarks.—The present form appears to be restricted to the region south of Columbia River. Judging from the specimens examined, the winter pelage in the district about Fort Klamath is either brown or white, probably according to the altitude. *Klamathensis* has the smallest, lightest, and most slender skull of the entire group of American varying hares. The skull of one white winter specimen from Fort Klamath, collected by Capt. Charles Bendire, is so small and slight, with such a narrow rostrum and small bullæ that it is with difficulty distinguished from skulls of *Sylvilagus bachmani ubericolor* from northern California. Between this and the heavier and more typical skulls of *klamathensis* exists every degree of gradation. One of the brown winter specimens from Fort Klamath is more intensely or brightly colored than the others, with a more reddish shade of vinaceous cinnamon, especially about the head, underside of neck, and fore feet, while the wash of black on the back (which is scarcely noticeable in the others) is strongly marked.

A young of the year taken in changing pelage at Donner, California, is darker and more cinnamon rufous on the back and head than the Klamath specimens. From the remarkable manner in which this group of rabbits breaks up into local forms in the Pacific coast region this difference may indicate that there is another local form in the Sierra Nevada. At present, however, the lack of material makes it necessary to refer the two specimens examined from there to *klamathensis*. The underfur of the brown specimen from Donner is light salmon buff on the top and pale plumbeous below. A white winter specimen from the same region has the underfur even paler salmon buff and plumbeous as in some white specimens from Fort Klamath.

Total number of specimens examined 10, from:

Oregon: Fort Klamath, 8.
California: Donner, 1; Pacific (Eldorado County), 1.

LEPUS BAIRDI HAYDEN.

ROCKY MOUNTAIN SNOWSHOE RABBIT.

(Pl. VI, fig. 3.)

Lepus bairdi **Hayden, Am. Naturalist, III, pp. 115–116, 1 text fig., May, 1869.** Type from near Fremont Peak, summit of Wind River Mountains, Wyoming; No. $\frac{4262}{38001}$, ad., U. S. National Museum; collected by Dr. F. V. Hayden, June 2, 1860 (in full summer pelage).

Geographic distribution.—Higher parts of Rocky Mountains from Idaho, Montana, and extreme eastern Washington and Oregon southeast through western Wyoming, eastern Utah, and middle Colorado to central New Mexico. Also probably extreme southern Alberta and extreme southeastern British Columbia, though no specimens have been seen from these areas. Vertical range from about 8,000 to 11,000 feet (timberline) in northern New Mexico and Colorado; zonal range, Canadian and Hudsonian.

General characters.—Size nearly the same as in typical *americanus*, but ears and hind feet longer; color in summer less iron gray and more dusky, or dusky reddish brown, than *americanus;* feet usually pure white; head deep reddish cinnamon contrasting with the more dusky color of body; approaches *cascadensis*, *washingtoni*, and *klamathensis* in the reddish brown of the upperparts.

Color in summer pelage.—Upperparts of body varying from dusky slightly buffy grayish brown to rusty cinnamon brown; wash of dusky strongest along top of back, about as in *americanus*, and rump even more blackish (about as in *macfarlani*); top of tail black; sides of body like back; top and sides of head deep reddish cinnamon mixed with dusky on crown and cheeks, but nearly pure about eyes and sides of nose; the color of head usually brighter and contrasting with the duller and darker color of body; basal front half of ears similar to top of head and shading into dusky near tip; posterior half of ears on outside dingy grayish on basal part and becoming blackish on terminal half; inside of ears dusky brownish with a well-marked white border around entire margin; nape dusky brown, duller than back; front and hind feet usually white, but one Idaho and one Wallowa Lake, Oregon, specimen have fore feet and legs and front border of thighs similar to head and tops of hind feet whitish with a thin mixture of rusty cinnamon hairs; underside of neck similar to sides of body but often much deeper or more richly colored; rest of underparts snowy white with color of flanks sometimes extending in on sides of abdomen.

Postjuvenal pelage (a half-grown specimen from Big Snowy Mountains, Montana).—Nearly uniform dull, slightly ochraceous, buffy, clearest about eyes and on feet; underside of neck rich rusty cinnamon. Another specimen of same age from the Snowy Mountains much duller and grayer than the one described and about intermediate between it and one from Wyoming.

Winter pelage.—Entirely pure white, except a narrow dusky border to tip of ears, and sometimes a mixture of brown along front of same; underfur uniform delicate salmon varying to pale salmon buff.

Skull.—Closely similar to that of typical *americanus*, but averaging lighter and slenderer with supraorbital process less strongly developed, zygomatic arch lighter; incisive foramina narrower; braincase narrower.

In most skulls of *bairdi* the supraorbital has the anterior process and notch more or less well marked, but in about one-third of the large series examined the supraorbital decreases in width anteriorly until the anterior process and notch are lacking nearly or quite as completely as in *washingtoni*. Skulls lacking the anterior process to the supraorbital usually have the rostrum slenderer and braincase narrower than those with a more strongly developed supraorbital, the latter character being accompanied by the broader rostrum and braincase, thus approximating *americanus*. The skulls with supraorbitals decreasing anteriorly are rather common from the type region in Wyoming, while those from Montana, Colorado, and New Mexico have the supraorbitals averaging more strongly developed. Some skulls from the Wind River Mountains are very close in general appearance to those of *washingtoni*. One skull from the Wallowa Mountains of northeastern Oregon is unusually large, with a remarkably long heavy rostrum and heavy supraorbitals with rather small but well-marked anterior process and notch. This skull is so different in general appearance from any other of this group examined that it must be an extreme case of individual variation. This appears more certain from the fact that another younger skull from the same place is like other slender skulls of *bairdi.*

Average measurements (*3 adults*).—Total length, 459; tail vertebræ, 39; hind foot, 146; ear from notch in dried skin, 70.

Remarks.—The considerable amount of material examined in the present connection shows that the supposed specific differences separating *bairdi* from the *americanus* group are likely to disappear when a series of specimens from the entire range of the two is available for comparison. Hitherto specimens of *virginianus* from the northern part of its range, or of *struthopus*, have usually been used for comparison to represent typical *americanus*, and the differences were easily established. But with a series of true *americanus* and its northwestern forms available the strong differences supposed to characterize *bairdi* tend to disappear or become much less important. Furthermore, the material at hand shows that specimens of *bairdi* from Idaho, northwestern Montana, the Blue Mountains of eastern Oregon, and Washington grade toward *klamathensis* of the southern Cascades and into the closely allied *cascadensis* of the northern Cascades. Specimens of *bairdi* from Colorado, New Mexico, and Wyoming are apparently indistinguishable from Wyoming specimens, but summer material from Colorado and south is very scanty. In a series of nearly twenty October specimens from Silverton, Colorado, just assuming the winter coat, the underfur is a delicate salmon buff nearly or quite to the base, the leaden basal color when present forming only a narrow band. Two winter specimens from Montana have the same salmon colored underfur, but a winter specimen from the Wind River Mountains, Wyoming, has a dull salmon buffy terminal band about one-third the length of the underfur with the basal two-thirds leaden bluish. Most of the considerable number of adult summer specimens of *bairdi* examined have the underfur nearly unicolor and varying from some shade of buffy (varying from dull salmon to dull ochraceous) to pale bluish gray. There is a wide range of variation in the color and even the color pattern on the underfur in summer. The summer season is so short in the cold, elevated summits where these rabbits live that there is but a short period between the spring and autumn molts, so that very few of the specimens examined show the perfect summer coat. For this reason changes in the underfur appear in progress almost throughout the summer. One Wind River Mountain specimen has the underfur tipped with dusky, with a broader zone of salmon buffy below this and a still broader plumbeous zone next the body. Young of the year in the postjuvenal pelage have the underfur marked with a buffy terminal band overlying a basal slaty bluish band of about equal width.

A specimen in summer pelage from Marcus, in northeastern Washington, is an intergrade with *cascadensis*, nearest the latter.

Total number of specimens examined 98, from:

Montana: Big Snowy Mountains, 2; Bozeman, 1; Essex, 1; Fort Benton, 1; Nyack, 3; St. Marys Lake, 5; Stanton Lake, 3.

Idaho: Big Lost River, 1; Bitter Root Valley, 1; Ketchum, 1; Moscow, 2; Mullan, 1; Sawtooth Lake, 2; Sinyakwatun Depot, 1.

Wyoming: Bull Lake, 1; Fort Bridger Reservation, 1; Hart Lake, 1; Le Barge Creek, 2; Lake Fork (Wind River Mountains), 9; Lewis Lake, 1; Shoshone Lake, 1; Snake River, 1; Wind River Mountains, 4; Yellowstone Lake, 2.

Colorado: Boulder County, 1; Coulter, 1; Gunnison County (divide between Sapinero and Curricanti creeks), 1; Gunnison County, 1; Irwin, 1; Mill City Canyon, 1; Sangre de Cristo Pass, 1; Silverton, 28; Sulphur Springs, 5.

New Mexico: Canton Burgwin, 1; Chama, 1; 45 miles northwest of Las Vegas, 6; Mount Baldy (Pecos), 1; Red River (30 miles north of Taos), 1.

LEPUS BAIRDI CASCADENSIS Nelson.

Cascade Mountain Snowshoe Rabbit.

Lepus bairdi cascadensis Nelson, Proc. Biol. Soc. Washington, XX, p. 87, December 11, 1907. Type from Roab's ranch, near Hope, British Columbia; No. 1886, ♂ ad., Museum of Comparative Zoology; collected by W. C. Colt, June 12, 1894.

Geographic distribution.—Cascade Mountains near extreme southern border of British Columbia from Hope, on Fraser River, south along east side of mountains at least to Martin and Easton, Washington. Vertical range undetermined; zonal range probably Canadian and Hudsonian.

General characters.—Color of upperparts most like that of *bairdi*, but darker and more dusky reddish cinnamon brown with rump more blackish; head clearer reddish cinnamon, contrasting with more dusky body; skull intermediate between that of *bairdi* and *washingtoni* in form and closely resembling that of *columbiensis*, the color in summer very different from both of these latter; ears large, as in *bairdi*.

Color in nearly perfect summer pelage.—Upperparts of body nearly uniform dusky, rusty cinnamon brown, only slightly darker on top of back than on flanks; rump, back of hind legs, and middle of tail on top blackish; rest of tail pure white; head brighter than body, rich dark reddish or rusty cinnamon, darkest on top and brightest on sides of nose and thence back around eyes to base of ears; top of fore legs and front border and adjacent parts on outside of hind legs dark rusty cinnamon similar to top of head; basal half of ears in front like top of head; terminal half black; back of ears dingy buffy brown more broadly edged and tipped with black than in *bairdi;* inside of ears dusky grayish and edged all around with whitish; underside of neck similar to top of head but paler rusty; underside of head whitish, more or less tinged with dull buffy and rusty; rest of underparts pure white mixed with color of flanks on sides of abdomen; underfur varies from pale grayish with slight tinge of salmon to strong salmon buffy with a narrow basal zone of pale slaty gray.

Winter pelage.—Entirely pure white, except a dusky border around tip of ears; underfur of specimens from near Hope varies from a pale to a dull dark (sometimes slightly cinnamon tinged) salmon, with a narrow basal zone of plumbeous gray, latter sometimes very pale and poorly marked.

The change from winter to summer pelage begins in April, and the white winter pelage is resumed in October and November. Specimens from Okanagan, British Columbia, in winter pelage have the underfur sometimes rich salmon buffy.

Skull.—Size and general appearance much like that of *washingtoni;* the same narrow, slender form, with supraorbitals commonly decreasing in width anteriorly so as to render the anterior process and notch obsolete; posterior process long, narrow (or rod-like), and often extending back to nearly touch the skull, and inclosing a large flattened oval notch; zygomatic arch the same; underside of skull, including the bullæ, the same, except that the incisive foramina are usually distinctly shorter, and broader at posterior end than in middle, having this character even more marked than in typical *columbiensis;* in top view skulls more closely resemble those of *washingtoni* and on underside those of *columbiensis* and *bairdi.*

Remarks.—It was with some hesitation that I ventured to describe another form of this group from a locality so near and between the areas occupied by two such well-marked forms as *washingtoni* and *columbiensis.* However, with a series before me of more than a dozen specimens, of which half are in more or less complete summer dress, I found they differed so much from the described forms that they could not be satisfactorily placed with any of them. They are most like *bairdi* in the general color of the upperparts, but are richer, darker, and more reddish, with blacker rumps, while the skulls average more slender, and the peculiar narrowing of the supraorbitals anteriorly is nearly as marked as in *washingtoni.* A summer specimen from Easton, Washington, is lighter and more reddish than those from Hope, and thus shows an approach toward *klamathensis*, but it has the characteristic blackish rump of *cascadensis.* The skulls of specimens from Easton and Martin however, have the anterior notch like those from Hope, while the incisive foramina are broadest in middle and narrow at posterior end as in *washingtoni*. The color of this form is so different from others of the group immediately adjacent to it in distribution that until more material shows actual intergradation I have considered it best to treat it as a subspecies of *bairdi*, with which the color and skull characters show intergradation. The close resemblance between the skulls of *cascadensis*, *columbiensis*, *washingtoni*, *klamathensis*, and *bairdi* is so strong that it indicates an extremely close relationship, although the color differences between some of them are marked; but sufficient material is not available to prove actual intergradation. The resemblance between *washingtoni* and *klamathensis*, however, is too close for them to be considered anything but subspecies. A single adult specimen from Skagit, British Columbia, which is typical *cascadensis* in color, has short supraorbital processes standing well out from the skull, with a well-marked anterior process and notch very different from average specimens. Two out of three specimens from Okanagan, British Columbia, in white pelage have the underfur rich deep salmon buff with a narrow zone of pale slate color next the body. One of these, shot March 29, is getting the summer coat in half a dozen small spots on the back and rump, and the color of these patches shows conclusively that the form at Okanagan is *cascadensis*. The last-mentioned individual has pale salmon buffy underfur, becoming plumbeous at base. A midwinter specimen from Okanagan is pure white, with only a duskiness about the borders of the ears, but the two killed in March have the ears more distinctly bordered with dusky, especially the posterior half of the tip. The specimens from Hope, British Columbia, show that by the last of October the change into the winter coat is well advanced. The July specimen from Easton, Washington, is the only one of this form seen in full summer dress. It has the tail black above and blackish on the terminal half of the underside and whitish only on the basal half of the lower side of the tail. Mr. Allan Brooks writes that the hares north of Fraser River are said to turn white in winter. These are no doubt *cascadensis*.

Total number of specimens examined 21, from:

British Columbia (Canada): Bonaparte (24-mile House), 1; Chilliwack Lake, 1; Elko, 1; Hope (Roab's ranch), 8; Okanagan, 3; Skagit, 1.
Washington: Easton, 1; Martin, 5.

SUBGENUS MACROTOLAGUS Mearns.

LEPUS CALLOTIS Group.

WHITE-SIDED JACK RABBITS.

This group contains the handsomest and most striking species of the North American Leporidæ. It is made up of five well-marked species and two subspecies, as follows: *Lepus callotis*, *L. flavigularis*, *L. altamiræ*, *L. gaillardi*, *L. gaillardi battyi*, *L. alleni*, and *L. alleni palitans*. In both external and skull characters the species show considerable diversity, but agree in two strong characters which serve to separate them from other jack rabbits. One is the absence of a black patch on the back of the ears at tip; the other is the presence of a whitish area covering the sides from shoulder to rump and extending from the abdomen well over the flanks, while the outside of the thighs and rump are usually gray. These lateral whitish areas are much more conspicuous in life than in skins.

It is safe to assume that the white on the sides serves the same purpose in all these species, since its use as a directive marking has been noted repeatedly by Goldman and myself in *Lepus alleni palitans*, *L. callotis*, and *L. flavigularis*.

By means of muscles the skin of either side can be drawn over the back at will. In this manner the buffy or brown dorsal area is shifted more or less completely to one side and the white on the opposite side is drawn nearly or quite to the median line. This habit has been observed when the rabbits were standing, or moving along at moderate speed, usually after they had been driven from their forms. This enlargement of the white area is always on the side turned toward the chance intruder, and accordingly alternates from side to side as the animals slowly zigzag away. In the bright sunlight the snowy white side flashes brilliantly, attracting attention from afar, and affording a fine example of directive coloration (see Pl. I). In the case of *L. flavigularis* I had the opportunity on several occasions of observing this display within 20 yards, and in that of *L. callotis* at a somewhat greater distance. One individual of *flavigularis* hopped slowly from its form, not 10 yards away, as I rode by on horseback, and, standing broadside, shifted the buffy dorsal area over, at the same time slowly drawing the white area up like a curtain until the side toward me was pure white, except a narrow buffy line along the top of the back. The rabbit then hopped slowly along in the direction I was riding, but gradually moved farther away, keeping the white area in the same position until it had traveled 50 or 60 yards, when the color areas slowly resumed their normal positions. I have seen *callotis* zigzag along, changing its course every 10 or 15 yards, and each time it turned it flashed the white on the side toward me. I am inclined to think this flashing of the white is most frequent during the rutting time.

The range of this group of species extends from southern Arizona and extreme southern New Mexico south to beyond the Isthmus of Tehuantepec (see fig. 9). The group is represented along the Pacific coast from Sonora to northern Tepic (*L. alleni palitans*). From southern Tepic south it is absent from the coastal region until it appears again on the shore of the Pacific at the Isthmus of Tehuantepec, in southern Oaxaca and Chiapas (*flavigularis*). On the east it reaches the Gulf coast only in extreme southern Tamaulipas (*altamiræ*). From southern New Mexico (*gaillardi*) it extends south in a narrow belt along the east side of the Sierra Madre to Durango (*gaillardi battyi*), and thence south over all the rest of the tableland and beyond the Sierra Madre, over the arid hills and valleys of the interior, including the Pacific slope beyond middle Oaxaca (*callotis*).

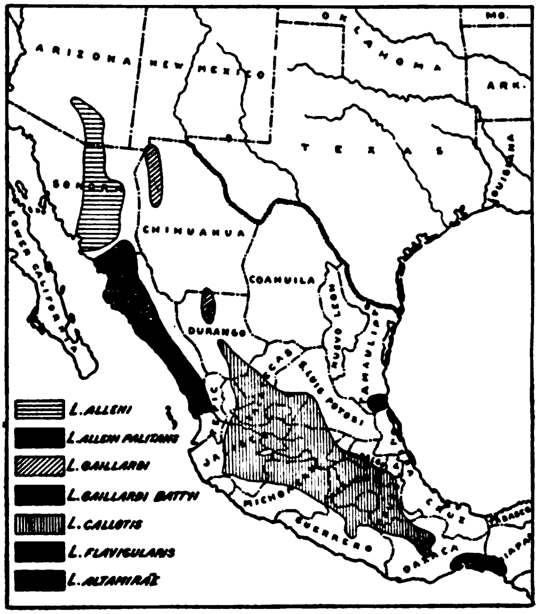

FIG. 9.—Distribution of the white-sided jack rabbits of the *Lepus callotis* group.

From this distribution it appears that the white-sided jack rabbits are a Mexican group, of which only two species range north far enough to cross the border in the United States. They are mainly Arid Tropical and Lower Sonoran in distribution, but *callotis* and *gaillardi* sometimes range through Upper Sonoran and, more rarely still, a short distance into the Transition Zone. The vertical range of the group is from sea level up to about 8,500 feet.

Lepus callotis, *gaillardi*, *altamiræ*, and *flavigularis* are most alike in general appearance. *L. alleni* is the handsomest and most strongly marked of the jack rabbits, its huge ears, long legs, short tail, and bright color completely differentiating it and making it one of the most remarkable and striking of American mammals.

Lepus altamiræ is less strongly differentiated from the *californicus* type of jack rabbit than the others, owing mainly to the less definite segregation of white on the sides.

Average measurements in the Lepus callotis group.

	No. of specimens averaged.	Skin.				Skull.							Origin of specimens averaged.
		Total length.	Tail vertebræ.	Hind foot.	Ear from notch, in dried skin.	Basilar length.	Length of nasals.	Breadth of rostrum above premolars.	Depth of rostrum in front of premolars.	Interorbital breadth.	Parietal breadth.	Diameter of bullæ.	
Lepus alleni........ ...	5	606.0	63.4	131.0	144.0	80.5	45.4	26.4	22.4	29.7	32.0	15.0	Near Tucson, Ariz.
Lepus alleni palitans..	5	571.0	57.0	131.6	142.0	83.7	49.4	28.7	24.6	29.7	32.5	13.7	Southern Sinaloa.
Lepus gaillardi.........	3	536.0	80.0	132.6	109.6	72.7	39.4	24.0	21.1	26.4	29.9	13.6	Northwestern Chihuahua.
Lepus gaillardi battyi[a]	5	449.9	59.4	123.7	112.0	70.0	38.7	24.4	21.7	25.7	28.7	13.6	Northern Durango.
Lepus callotis.........	5	560.0	71.0	135.0	117.1	72.6	40.6	25.3	22.4	28.0	30.6	14.1	Puebla and Morelos.
Lepus altamiræ	5	587.0	72.0	136.0	110.6	77.1	44.9	26.7	22.6	26.8	30.4	13.8	Alta Mira, Tamaulipas.
Lepus flavigularis.....	5	595.0	77.0	133.0	112.0	75.7	45.3	27.2	24.2	26.9	31.7	12.6	South side Isthmus Tehuantepec.

[a] The skin measurements of this series show certain discrepancies which indicate a method of measuring different from that in common use.

LEPUS ALLENI Mearns.

Antelope Jack Rabbit.

(Pl. VII, fig. 4; pl. VIII, fig. 4.)

Lepus alleni Mearns, Bull. Am. Mus. Nat. Hist., N. Y., II, pp. 294–297, February, 1890. Type from Rillito Station, Pima County, Arizona; No. 2412, ♂ ad., American Museum of Natural History; collected by Dr. E. A. Mearns, May 8, 1885.

Geographic distribution.—The desert plains of southern Arizona, from Phoenix, Tucson, and Benson, south through similar country to a little beyond Guaymas, in northern Sonora, Mexico. Vertical range from near sea level in Sonora up to about 3,500 feet in southern Arizona; zonal distribution Lower Sonoran.

General characters.—*Lepus alleni*, including its subspecies *palitans*, is the handsomest and most striking of the North American hares, and, with the exception of *campestris* and *grœnlandicus*, is the largest of the North American species. Typical *alleni* is characterized by long slender legs, enormous ears, very small short tail; color on sides of shoulders, flanks, sides of abdomen, rump, and outside of hind legs uniform iron gray; skull largest among American rabbits, except *palitans*.

Color in fresh winter pelage.—Top and side of head dingy creamy buff, slightly washed on top with black, and sides paler or grayer, shading back into gray on sides of neck and nape; middle of nape dingy buff or brownish buff washed with gray; ring around eye buff or buffy white; top of back cream buff (sometimes with a light pinkish tinge) washed with black; sides of shoulders, flanks, sides of abdomen, rump, and outside of hind legs light iron gray; middle of tail on upper side, and extending up as a short median line at base of rump, black; rest of tail white; front of fore legs and tops of fore feet pale grayish buff grizzled with dusky; inside of fore legs and inside of thighs white or pale gray; underside of head, chest, and middle of abdomen and back to include sides of base of tail, front of hind legs, and tops of hind feet, pure white; underside of neck rich buff, sometimes tinged with ochraceous, but never so rich as in *palitans;* front half of ears buffy or sandy gray; entire back of ears paler, more whitish; front of ears bordered with a fringe of long grayish or yellowish gray hairs with a short dusky area near tip; tip of ears pale buff or buffy white and posterior border narrowly edged with velvety white.

Skull.—Very large; rostrum long and heavy; frontal area broad; supra- and postorbitals broad and heavy, posterior end of postorbitals rest on small bony processes of skull and inclose long narrow postorbital foramina; anterior notch in front of supraorbital process small and sometimes obsolescent; molar series heavy; bullæ small; basioccipital long and not deeply constricted posteriorly; in general shape skull most like that of *L. flavigularis*, but much larger.

Average measurements (5 adults).—Total length, 606; tail vertebræ, 63.4; hind foot, 131; ear from notch in dried skin, 144.

Remarks.—The pale typical form of this handsome species is limited mainly to the hot plains of southern Arizona. Specimens from Magdalena, Sonora, not far south of the Arizona border, are more richly colored than those from Arizona and the increase in intensity continues to the southward; specimens from south of Guaymas must be placed with the more brightly colored *palitans*.

Total number of specimens examined 28, from:

Arizona: Calabasas, 1; Casa Grande, 1; Fort Lowell, 6; Oracle, 1; Picacho Station, 1; Rillito Creek, 3; Rillito Station, 1; Tucson, 4.
Sonora (Mexico): Batamotal, 2; Hermosillo, 2; Magdalena, 2; Oputo, 1; Ortiz, 3.

LEPUS ALLENI PALITANS BANGS.

SINALOA JACK RABBIT.

Lepus (Macrotolagus) alleni palitans Bangs, Proc. New England Zool. Club, I, pp. 85–86, February 23, 1900. Type from Agua Caliente, southern Sinaloa, Mexico; No. 9096, ♀, ad., Museum of Comparative Zoology (Bangs collection); collected by P. O. Simons, August 7, 1897.

Geographic distribution.—Coastal plains of northwest Mexico from a little south of Guaymas, in southern Sonora, south through Sinaloa to Rosa Morada in northern Tepic. Vertical range from near sea level to about 2,000 feet in southern Sonora; zonal range Arid Tropical and lower part of Lower Sonoran Zone.

General characters.—Similar to *alleni*, but even handsomer, with sides of head and back much richer and brighter cream buff or pinkish buff; and tail with less black on upperside; skull larger, rostrum heavier, and bullæ smaller.

Color in fresh winter pelage.—Top of head and back varying from deep cream buff to dark rich pinkish buff washed with black; sides of nose dark cream buff shading into buffy grayish on cheeks and sides of head back of eyes; ring around eyes gray; nape and sides of neck, just back of head, dingy grayish, sometimes becoming dusky or dull buffy along middle of nape; sides of body, including shoulders, flanks, sides of abdomen, rump, and outside of hind legs, nearly uniform light iron gray; middle of top of tail usually blackish, but the black line along middle of rump and sometimes the black on top of tail obsolescent; underside of head white, shading into gray on sides of neck; underside of neck vivid ochraceous buff, shading up on sides of neck posteriorly into color of back; front of fore legs and tops of fore feet pale cream buff lightly grizzled with black; underside of fore legs and inside of thighs pale gray or white; underside of chest, middle of abdomen, and back around both sides of base of tail, front of hind legs, and tops of hind feet, pure white; ears nearly uniform dull sandy or grayish buffy, scantily clothed with short hairs on both front and back, but edged along front with a fringe of long dull buffy gray hairs becoming dusky for an inch near tip; posterior edge with a narrow border of velvety white changing about tip to buff.

Skull.—Larger than that of any other American rabbit; similar to that of typical *alleni*, but larger, with nasals longer, rostrum heavier, and bullæ smaller.

Average measurements (5 adults).—Total length, 571; tail vertebræ, 57; hind foot, 131.6; ear from notch in dried skin, 142.

Remarks.—This subspecies is decidedly more brightly colored than *alleni;* it also has a wider range. The most intensely colored specimens are from Alamos, southern Sonora. These have the back deep vivid pinkish buff, heavily washed with black. The underside of the neck is a richer ochraceous buff, and the sides of the body a clearer iron gray than in specimens from southern Sinaloa, whence came the type of *palitans.* One specimen from Escuinapa, Sinaloa, has most of the top and sides of the head and the adjoining parts of the neck (except for a thin wash of black on crown and gray wash on nape) a clear deep creamy buff, approaching the ochraceous buffy of the underside of the neck.

Total number of specimens examined 26, from:

Sonora (Mexico): Alamos, 2.
Sinaloa (Mexico): Culiacan, 2; Escuinapa, 16; Los Limones, 3; Rosario, 1.
Territory of Tepic (Mexico): Acaponeta, 2.

LEPUS GAILLARDI MEARNS.

GAILLARD JACK RABBIT.

Lepus gaillardi Mearns, Proc. U. S. Nat. Mus., XVIII, pp. 560–562, June 24, 1896. Type from west fork Playas Valley, southwestern New Mexico (near Monument 63 on Mexican boundary); No. $\frac{20525}{35714}$, ♂ ad., U. S. National Museum; collected by Dr. E. A. Mearns and F. X. Holzner, June 17, 1892.

Geographic distribution.—Grassy plains of southwestern New Mexico near Mexican border and southward, along eastern base of Sierra Madre, through adjacent parts of northern Chihuahua. Vertical range from about 4,500 to 7,000 feet in northwestern Chihuahua; zonal range mainly Upper Sonoran extending into lower part of Transition Zone.

General characters.—Much like *callotis* in size and general appearance, but differs in having nape plain buff, without a trace of black, and upperparts paler, more vinaceous buff.

Color in worn pelage.—Top and sides of head and back deep dull vinaceous buff approaching fawn color; nape the same, but duller; front half of ears dull buff; posterior half white, without trace of black at tip; inside of ears buff, becoming ochraceous buff on fringe along front border and buffy white on posterior edge; a narrow dusky line on membrane inside of ear, along posterior border, widening to form a broad black patch an inch wide underlying the short buffy hairs at tip; rump with outside and back of hind legs pale iron gray, sometimes becoming whitish from loss of black hairs; rump divided by a median line of dusky extending down and becoming black over upper surface of tail; underside of tail to tip white; front of hind legs and tops of feet white; front of fore legs and tops of feet gray, palest on feet; underside of head dull buff becoming whitish in middle; underside of neck dark dull buff; rest of underparts, including flanks, white; white of flanks less strongly contrasting with rump in *gaillardi* than in *callotis*, owing to paler color of rump patch in *gaillardi*.

Skull.—Much like that of *callotis* but smaller, with similar short, broad supra- and postorbital processes raised even higher above plane of frontals than in *callotis*, thus giving a sunken appearance to frontal area just back of nasals; rostrum lighter and more tapering than in *callotis;* frontal area broad and depressed; basioccipital small, proportionately long and narrow with only a slight constriction posteriorly, thus leaving the sides nearly straight and parallel.

Average measurements (*3 adults*).—Total length, 536; tail vertebræ, 80; hind foot, 132.6; ear from notch in dried skin, 109.6.

Remarks.—This is one of the rarest of the jack rabbits and has a comparatively limited distribution. So far as known, it occurs mainly along the eastern basal slopes of the Sierra Madre in Chihuahua, extending thence over the immediately adjacent part of the grassy plains and westward into the open pine forest of the Sierra Madre. We found it to be rare in the pine forest up to 7,000 feet near Colonia Garcia. It is altogether probable that the individuals found in this forest were merely stray summer residents which returned to the foothills and plains in winter.

Total number of specimens examined 7, from:

Chihuahua (Mexico): Colonia Juarez, 2; Whitewater, 5.

LEPUS GAILLARDI BATTYI Allen.

Durango Jack Rabbit.

Lepus (*Macrotolagus*) *gaillardi battyi* Allen, Bull. Am. Mus. Nat. Hist., XIX, p. 607, November 12, 1903. Type from Rancho Santuario, northwestern Durango, Mexico; No. 21257, ♂ ad., American Museum Natural History; collected by J. H. Batty, February 17, 1903.

Geographic distribution.—East base of Sierra Madre and adjacent plains of northwestern Durango and southwestern Chihuahua. Vertical range from about 4,500 to 6,500 feet in north-central Durango; zonal range mainly Upper Sonoran.

General characters.—Similar to *gaillardi* but smaller and upperparts paler, especially on head and neck.

Color in slightly worn winter pelage.—Upperparts, including top and sides of head, neck (with entire nape), and back varying from nearly uniform rich buff to pinkish or creamy buff; usually palest on head and neck, and a well-marked wash of black over top of head and back; sometimes a slight wash of black on sides of head; neck all around always plain buff, much paler on underside; sides of head commonly like neck; ring around eye white; top of rump whitish mixed with a varying amount of buffy and gray; but slight trace of black median line above base of tail; top of tail black; underside white; front half of ears varying from buffy to grayish buffy; posterior half varying from buff to grayish white on basal part, becoming velvety white on terminal third; inside of ears dull buffy or buffy gray with the membrane darkened along posterior border and about tip; ear bordered anteriorly by a fringe of long buffy or buffy gray hairs which become shorter and dusky for about an inch near tip; posterior border edged with velvety white; underside of head and body, including sides of shoulders, flanks, entire hind legs, tops of hind feet, and most of rump white; front of fore legs pale dull grayish; tops of fore feet whitish; on sides of hips, rump and, to a less degree, along flanks, occur scattered black hairs, but less abundantly than in typical *gaillardi.*

Skull.—Smaller than in *gaillardi* with bullæ proportionately larger; basioccipital more strongly constricted posteriorly, giving a more rounded outline to sides.

Average measurements (5 adults).—Total length, 449.9; tail vertebræ, 59.4; hind foot, 123.7; ear from notch in dried skin, 112.

Remarks.—This is not a strongly marked subspecies, but the paler colors and smaller size of specimens from northern Durango appear constant enough to warrant recognition of Doctor Allen's name. The material for comparison, however, is still rather scanty, particularly in the case of *gaillardi*, and most of that available is in more or less worn pelage.

Total number of specimens examined 6, from:

Durango (Mexico): Rancho Santuario, 3; Rio Campo, 3.

LEPUS CALLOTIS WAGLER.

WHITE-SIDED JACK RABBIT.

(See frontispiece; Pl. VII, fig. 3; Pl. VIII, fig. 3.)

Lepus callotis Wagler, Naturliches System Amphibien, p. 23, 1830. Type from Mexico (southern end of Mexican Tableland); in Berlin Museum.

Lepus mexicanus Lichtenstein, Abhandl. K. akad. Wiss., Berlin (1827) 1830, p. 101. Type from "Mexico" (southern end of Mexican Tableland) in Berlin Museum; collected by F. Deppe.

Lepus nigricaudatus Bennett, P. Z. S., London, 1833, pp. 41–42. Type from "that part of California which adjoins to Mexico" (probably southwestern part of Mexican Tableland); No. 53. 8. 29. 37, British Museum.

Geographic distribution.—Open plains of southern half of Mexican Tableland from central Durango, northern Zacatecas, and central San Luis Potosi south through Aguas Calientes, most of Jalisco, northern Michoacan, Guanajuato, Queretaro, State of Mexico, Federal District, Hidalgo, Puebla, Morelos, the northwestern half of Oaxaca, and the northern half of Guerrero. Vertical range from about 2,500 feet in Morelos to 8,500 feet in northern Puebla; zonal range Upper and Lower Sonoran and into upper border of Arid Tropical Zone.

General characters.—Size medium; hair coarse; upperparts dark, slightly pinkish, buff heavily washed with black; nape black; back of ears mainly white without trace of black tip; flanks white; rump iron gray.

Color in fresh winter pelage.—Top and sides of head and back dark pinkish buff heavily overlaid with black; nape black, sometimes grizzled on surface with gray; front half of ears dark buff or grayish buff; posterior half black on basal third, and white on terminal two-thirds, with no trace of black at tip; front border of ears fringed with buff or ochraceous buff hairs; posterior border and entire tip velvety white; inside of ears with a well-marked dusky line on membrane along posterior border, broadening to form a broad blackish patch underlying the buffy hairs at the tip; rump, with back and outside of hind legs, iron gray; front of hind legs and tops of feet white; median line of black on rump not strongly marked and not extending much above base of tail; entire top, sides, and tip of tail black; basal two-thirds of underside of tail white, terminal third black; front of fore legs and tops of fore feet varying from pale gray to dull iron gray, palest on feet; underside of neck dull dark grayish buff, varying to buffy drab; rest of underparts, including flanks, white; the white on flanks extends high up on sides and ends abruptly posteriorly against iron gray of rump patch; a few scattered long black hairs occur throughout the white of underparts and flanks.

In worn pelage most of the heavy black wash on the upperparts is lost, and the upperparts bleach to a pale buffy pinkish or buffy yellowish.

Skull.—Rather short and stout with upper outline high-arched; nasals proportionately short and less tapering toward tip than in *californicus*, thus giving rostrum a heavier appearance when viewed from above; supra- and postorbital processes short and broad, raised higher above plane of frontals than usual, and divergent posteriorly, with tip usually free; jugal broad and flat with a pit anteriorly; basioccipital rather small and strongly constricted posteriorly.

Average measurements (5 adults).—Total length, 560; tail vertebræ, 71; hind foot, 133; ear from notch in dried skin, 117.1.

Remarks.—The names *callotis* and *mexicanus* were published the same year, but I have been unable to learn the exact dates of publication, and until these can be ascertained I have retained the name in common use.

There is considerable general resemblance between *L. callotis* and *L. gaillardi*, but on close comparison they appear to be perfectly distinct species. *L. callotis* shows comparatively little variation from one extreme of its range to the other. There is some variation, however, and a specimen from the city of Durango has less black than usual on the nape. Another specimen from the city of Oaxaca, at the opposite extremity of its range, is yellower or more buffy on the underside of the neck. The skull of this specimen is the largest in the series, with huge supraorbital processes and rather larger bullæ than the average. A specimen from Tlapancingo, Oaxaca, has the yellow on the underside of the neck similar to the one from the city of Oaxaca, and it is possible that a recognizable subspecies exists in the valley of Oaxaca and surrounding region.

In the introduction and under the general notes on the *callotis* group the use of directive coloration by this species is given in detail. This habit in *callotis* was first noted on the plains southwest of Cuernavaca, Morelos, in January, 1893.

Total number of specimens examined 50, from:

Durango (Mexico): Durango City, 1.
Zacatecas (Mexico): Monte Escobedo, 1.
San Luis Potosi (Mexico): Arenal, 2.
Jalisco (Mexico): Ameca, 2; Arroyo de Gavilan, 9; Atenquiqui, 1; Etzatlan, 2; Huehuquilla, 1; La Barca, 1; Lagos, 1; Las Canoas, 2; La Laja, 4; Ocotlan, 1; Teuchitlan, 1; Zapotlan, 1; Reyes, 1.
Michoacan (Mexico): Los Reyes, 1; Querendaro, 1.
Guanajuato (Mexico): Celaya, 1.
Hidalgo (Mexico): Marques, 1; Tulancingo, 1.
Morelos (Mexico): Cuernavaca, 6.
Puebla (Mexico): Atlixco, 4; San Martin, 1; Tehuacan, 1.
Oaxaca (Mexico): Oaxaca City, 1; Tlapancingo, 1.

LEPUS ALTAMIRÆ NELSON.

TAMAULIPAS JACK RABBIT.

Lepus merriami altamiræ Nelson, Proc. Biol. Soc. Washington, XVII, p. 109, May 18, 1904. Type from Alta Mira, Tamaulipas, Mexico; No. 93691, ♂ ad., U. S. National Museum (Biological Survey collection); collected by E. W. Nelson and E. A. Goldman, May 16, 1898.

Geographic distribution.—Coastal plains of southern Tamaulipas, extreme northern Vera Cruz, and eastern border of San Luis Potosi, Mexico. Vertical range from sea level to at least 500 feet in Tamaulipas; zonal range Arid Tropical.

General characters.—In size and color of upperparts, including iron gray rump patch, resembling *L. merriami asellus* but paler and more buffy yellowish; nape with two lateral black bands extending back from base of ears, and separated by a median band of buffy; posterior half of ears white without any trace of black at tip; white of underparts extending up on flanks nearly as in *L. callotis.*

Color in faded spring pelage.—Top of head and back creamy buff, thinly washed with black; sides of head clearer and brighter buff; nape marked by two broad black stripes beginning on posterior base of ears, extending back, and separated by a narrower median band or stripe of buff similar in color to back; front half of ears dark buff; posterior half white, as in *callotis*, with no trace of black at tip; inside of ears buff, except for a darker shade near posterior border, a very narrow border of white along extreme edge and a darkening of the skin near the tip; this dark part sometimes edged with black hairs on extreme tip; sides of head and shoulders similar to back but paler or less washed with black; rump, with sides and back of hind legs, iron gray with a median line of black extending from base over upper surface of tail; underside of tail gray; front of hind legs and top of hind feet white; front of fore legs and feet grayish buffy, sometimes changing to whitish on tops of fore feet; underside of neck deep buff, brighter and more intense than back; rest of underparts and most of flanks white, almost as in *callotis*, the white on sides ending abruptly against the iron gray area on rump and hind legs.

Skull.—In general resembles that of *callotis*, but much longer and proportionately narrower, with rostrum broad, heavy, and slightly tapering; supra- and postorbital processes small and slender, as in *L. c. texianus*, with a deep notch in front; braincase narrow and depressed; frontal area smooth and slightly arched, as commonly seen in *L. c. merriami* and *L. californicus;* basioccipital rather narrow and not much constricted posteriorly, with sides but slightly curved.

Average measurements (5 adults).—Total length, 587; tail vertebræ, 72; hind foot, 136; ear from notch in dried skin, 110.6.

Remarks.—This well-marked species was described originally as a subspecies of *L. merriami.* A more careful examination of the material shows that its relationships are with the members of the white-sided *L. callotis* group. Superficially the color of the upperparts resembles *merriami*, but the lack of a black patch on the posterior half of the ear at the tip and the white flanks (somewhat obscured in some of the original specimens) are strong characters which place it in the *callotis* group.

Total number of specimens examined 6, from:

Tamaulipas (Mexico): Alta Mira, 6.

LEPUS FLAVIGULARIS WAGNER.

TEHUANTEPEC JACK RABBIT.

Lepus callotis var. γ *flavigularis* Wagner in Schreber's Säugthiere Suppl. IV, pp. 106–107, 1884. Type from Mexico (probably near Tehuantepec City, Oaxaca); in Monaco Museum; collected by Karwinski.

Geographic distribution.—Coastal plains and bordering foothills on southern end of Isthmus of Tehuantepec, in southern Oaxaca, and thence along Pacific coast to beyond Tonala, Chiapas. Vertical range from sea level up to about 2,000 feet in southern Oaxaca; zonal range Arid Tropical.

General characters.—Size same as *callotis;* hair coarse; upperparts bright ochraceous buff strongly washed with black; ears entirely buff with no sign of black near tip on posterior half; nape with a black stripe back from base of each ear and a median stripe of buff; flanks and underparts of body white; rump iron gray.

Color in fresh fall pelage.—Top and sides of head and back rich ochraceous buff heavily washed with black; nape with a broad median line of dull ochraceous buff separating two black stripes beginning on posterior bases of ears and extending back; these black stripes usually narrow and tapering posteriorly to a slender point; in some specimens, especially in worn pelage, these black stripes become more or less obsolete, or exist only as black patches on the posterior bases of the ears; rest of ears dark ochraceous buff, with a slightly more richly colored border of same all around the edge, sometimes becoming buffy white along extreme posterior edge; rump, with outside and back of hind legs, iron gray; front of hind legs and top of hind feet white; middle of rump divided by a black line extending down over upper surface of tail; underside of tail gray; fronts of fore legs vary from iron gray to grayish white, becoming paler and more buffy on tops of fore feet; underside of neck very rich ochraceous buffy; rest of underparts white, latter color extending up over flanks and ending abruptly, as in *callotis*, against iron gray area of rump and hind legs.

Skull.—Most like that of *alleni*, with proportionately smaller bullæ; supra- and postorbital processes short and broad as in *callotis*, but joined more broadly to skull at base; the supraorbitals joined closely to skull anteriorly and anterior notch nearly or quite obsolete, thus giving great frontal breadth; postorbital process broadly ossified and attached to skull posteriorly; postorbital foramina narrower than in most other species; rostrum compressed laterally, unusually high-arched, and tapering more rapidly toward tip than in *callotis;* bullæ very small, smaller than in any other Mexican jack rabbit; basioccipital large, broad, and strongly constricted posteriorly.

Average measurements (*5 adults*).—Total length, 595; tail vertebræ, 77; hind foot, 133; ear from notch in dried skin, 112.

Remarks.—In worn spring pelage the black wash on the back wears away and the buff of the upperparts fades to a pale yellowish shade, but the rich buff of the underside of the neck changes less and is always conspicuous. The plain yellow ears and the stripes on the nape are strongly diagnostic. This species appears to be very distinct and to be wholly tropical in distribution. The resemblance between *flavigularis* and *callotis* is sufficiently close, however, to render it barely possible that a series of specimens covering the hilly country between the valley of Oaxaca and the Isthmus of Tehuantepec may prove them to be specifically identical.

Total number of specimens examined 28, from:

Oaxaca (Mexico): Huilotepec, 24; San Mateo del Mar, 3; Santa Efigenia 1.

LEPUS CALIFORNICUS Group (Subgenus MACROTOLAGUS).

GRAY-SIDED JACK RABBITS.

The present group comprises *Lepus californicus* and subspecies, *wallawalla*, *richardsoni*, *deserticola*, *bennetti*, *martirensis*, *magdalenæ*, *xanti*, *eremicus*, *texianus*, *melanotis*, *merriami*, *asellus*, and *festinus* with the closely related *L. insularis*. *L. californicus*, including its subspecies, covers an enormous territory, and is by far the most widely spread of the jack rabbits. It is the typical and well-known jack rabbit of the western United States, where some form occupies all parts of the country from Kansas and Texas to the Pacific coast and from South Dakota and the Columbia River to the Mexican border. In Mexico it ranges from the mouth of the Rio Grande to the Pacific coast, including all of Lower California, and from the northern border south to the Valley of Mexico (see fig. 10). This great area includes several life zones from the extreme upper border of the Arid Tropical up through the Arid Lower Sonoran and Arid Upper Sonoran well into the Transition Zone. Its vertical range in Mexico reaches from sea level, at the mouth of the Rio Grande, to about 8,000 feet near the Valley of Mexico. The great diversity of climatic and physiographic conditions in the range of the group has resulted in the development of the large number of geographic races listed above. The differences among typical examples of the most divergent subspecies are so great that many of them have been considered distinct species. Fortunately, abundant material is now available to prove the true relationship of these several forms and to actually demonstrate the intergradation of such diverse subspecies as *californicus*, *deserticola*, *merriami*, and *melanotis*. The striking differences between *californicus* and *melanotis* at the two extremes of the range of the group in the United States is equaled by difference between subspecies living within a comparatively limited area in California. There, on the humid coast, lives the large dark-colored typical *californicus*, while only a few miles inland, in the hot dry San Joaquin Valley, is the pale *richardsoni;* and a little farther south, on the Mohave and Colorado

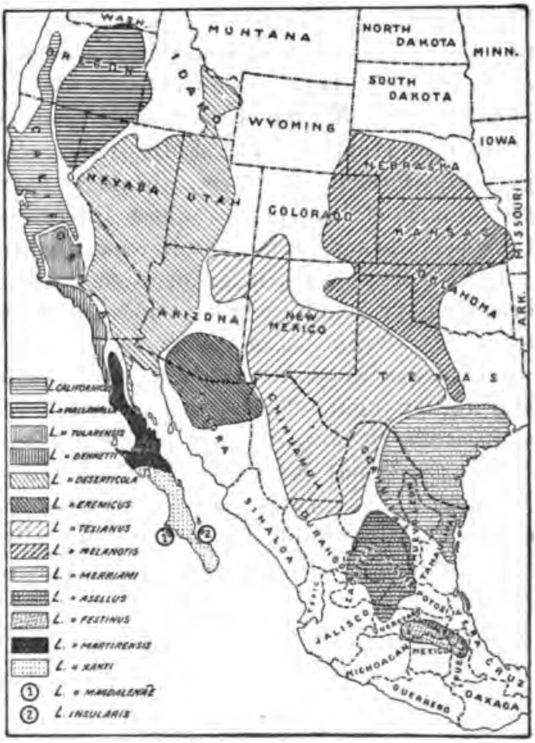

FIG. 10.—Distribution of black-tailed jack rabbits of the *Lepus californicus* group.

deserts, is the still more different pale gray *deserticola.* These changes in color and other characters within such short distances are indicative of corresponding changes in climatic conditions and of the ready response of the species to such influences.

The most extraordinary member of this group is the black-backed *Lepus insularis* on Espiritu Santo Island, at the mouth of La Paz Bay, Lower California, which is mentioned in detail in the introduction.

One of the most interesting facts developed by a study of the recent collections is the proof of direct intergradation in south central Texas between *L. merriami*, previously considered a distinct species, and *L. c. texianus*, thus adding *merriami* to the list of subspecies of *californicus.* The black nape, the most strongly marked character of *merriami*, is gradually lost to the north and east on the outskirts of its range in Texas. To the south *merriami* grades into the black-naped *asellus* of San Luis Potosi and this into the gray-naped *festinus* of Hidalgo. The skulls of the *californicus* group have much general similarity in form, although varying considerably in size and minor details. The strongest differences are those of size, and on this basis the subspecies may be separated roughly into two groups:

1. Subspecies with large massive skulls, with heavy rostrum and broad, heavy jugal. These include *californicus*, *eremicus*, *melanotis*, *texianus*, *merriami*, and *asellus.*

2. Subspecies with smaller, lighter skulls, with slenderer rostrum and lighter jugal. These are *bennetti*, *martirensis*, *magdalenæ*, *xanti*, *deserticola*, *richardsoni*, *wallawalla*, *festinus*, and *insularis.*

The occasional enormous abundance of some of the subspecies of *californicus* in various parts of the west causes serious loss to agriculture. Throughout the arid regions, where irrigated crops are grown, the black-tailed jack rabbits are among the most noxious rodents.

Average measurements in the Lepus californicus group.

	No. of specimens averaged.	Skin.				Skull.							Origin of specimens averaged.
		Total length.	Tail vertebræ.	Hind foot.	Ear from notch, in dried skin.	Basilar length.	Length of nasals.	Breadth of rostrum above premolars.	Depth of rostrum in front of premolars.	Interorbital breadth.	Parietal breadth.	Diameter of bullæ.	
Lepus californicus.......	5	604	95.0	131	125	76.9	41.8	24.0	21.6	26.9	30.9	12.6	Monterey County, California.
Lepus californicus wallawalla.	5	581	101.0	135	114	71.2	37.2	23.6	19.0	26.1	30.3	12.8	Washington, Oregon, California.
Lepus californicus richardsoni.	5	570	97.0	125	112	70.7	39.7	23.3	20.0	26.8	29.8	12.9	District near Alila, California.
Lepus californicus bennetti.	5	556	86.0	121	114	71.0	37.4	22.7	19.1	25.7	31.0	13.5	Near San Diego, California.
Lepus californicus deserticola.	5	542	88.4	122	124	69.9	36.2	22.4	18.7	25.3	30.0	13.2	Colorado Desert, California.
Lepus californicus eremicus.	5	595	99.8	134	123	74.6	41.1	24.7	21.8	28.5	30.8	14.9	Southern Arizona.
Lepus californicus texianus.	5	606	85.0	133	123	75.2	40.8	24.7	21.4	25.7	29.9	14.5	Western Texas.
Lepus californicus melanotis.	5	582	80.0	131	104	74.5	41.2	25.8	22.6	26.8	31.1	13.6	Eastern Kansas.
Lepus californicus merriami.	5	592	96.8	128	114	74.9	41.1	26.6	22.7	26.2	30.9	14.7	Fort Clark, Texas.
Lepus californicus asellus.	5	589	75.0	126	124	75.9	40.0	25.8	22.1	27.5	31.1	14.9	San Luis Potosi, Mexico.
Lepus californicus festinus.	5	552	77.4	124	129	72.1	38.9	23.1	20.7	25.2	30.4	13.7	Southern Hidalgo, Mexico.
Lepus californicus martirensis.	5	568	95.8	125	131	74.5	38.4	23.1	19.6	27.4	29.3	13.8	San Pedro Martir Mountains, Lower California.
Lepus californicus magdalenæ.	5	535	92.2	115	99	67.3	34.9	21.1	17.9	24.9	29.2	13.7	Magdalena and Margarita Islands.
Lepus californicus xanti.	5	523	80.0	113	116	70.0	36.7	23.1	20.8	27.0	30.0	13.3	Santa Anita, Lower California.
Lepus insularis..........	5	574	95.8	121	105	74.3	40.1	23.0	19.1	26.1	32.1	14.2	Espiritu Santo Island, Lower California.

LEPUS CALIFORNICUS Gray.

California Jack Rabbit.

(Pl. VII, fig. 1; Pl. VIII, fig. 1.)

Lepus californica Gray, P. Z. S., 1836, p. 88, *nomen nudum*.

Lepus californica Gray, Mag. Nat. Hist. (Charlesworth), I, pp. 586–587, 1837. Type from St. Antoine, California (probably from coastal slope of mountains near the Mission of San Antonio, Jolon, Monterey County); No. 53.8.29.30, British Museum; collected by David Douglas in May, 1831.

Geographic distribution.—Humid coast belt of California from Gaviota Pass north to Cape Mendocino, spreading inland over extreme northern end of San Joaquin Valley, all of Sacramento Valley, up through the adjacent foothills of the Sierra, and north through Shasta Valley to Rogue River and Willamette Valley in Oregon. Vertical range from sea level at San Francisco up to about

3,000 feet altitude on west slope of the Sierra; zonal range mainly Upper Sonoran and lower border of the Transition Zone.

General characters.—Size, large; color, darkest of the jack rabbits, except *L. insularis;* upperparts dark ochraceous brown or dark buffy brown; lower flanks and most of underparts deep ochraceous buff, sometimes approaching dark salmon buff; ears dark brown.

Color in fresh winter pelage.—Top of head and upperparts varying from dark ochraceous buffy to dark salmon buffy strongly washed with black, producing a dark buffy brown color; sides of body with much less overlying black than on back and shading downward into a clearer dark ochraceous buffy (sometimes salmon buffy) on lower flanks and most of underparts, but paler on middle of abdomen; outside of hind legs similar to sides of body, but darker or browner; lower parts of shoulders and upper parts of fore legs brighter and richer than sides of body, becoming deep cinnamon or even cinnamon rufous in richly colored specimens and shading into whitish on tops of fore feet; tops of hind feet whitish like fore feet, and contrasting strongly with color of legs; underside of head dull whitish; underside of neck dark dull buff darker than rest of underparts and varying to deep cinnamon or ochraceous cinnamon; sides of nose dull grayish; orbital area ochraceous buff; nape dark cinnamon, varying to dark isabella color; front half of ears dark brown finely grizzled with cinnamon or dark buff; posterior half of ears white with a strong black tip varying from 1 to 2 inches in length; inside of ears with a heavy band of dark brown along posterior side next the narrow, velvety white or buffy border; top of tail black, the black area extending up slightly on middle of rump; underside dull dark buff; no rump patch.

Color in summer.—Fading and bleaching to a much paler color than in winter, with the nape becoming buffy grayish and the underparts pale dull buffy, sometimes almost whitish.

Postjuvenal pelage.—Paler than adults; upperparts less heavily washed with black, giving a more finely grizzled, salt and pepper effect.

Skull.—Large; proportionately heavier and more massive across base of rostrum and frontal area than in any other Pacific coast form; frontal area full and but slightly lower than plane of supraorbital processes; upper outline of rostrum and frontal region distinctly curved; supraorbitals proportionately light and attached to skull by narrow bases with a deep open notch anteriorly; postorbital process touching skull at posterior tip, inclosing a large oval foramen; jugal fairly heavy but distinctly narrower and lighter than in the other large skulled forms (*eremicus*, *texianus*, *melanotis*, *merriami*, and *asellus*); bullæ actually as well as proportionately smaller than in any other member of the group, irregularly rounded, and often drawn down posteriorly to a blunt point.

Average measurements (*5 adults*).—Total length, 604; tail vertebræ, 95; hind foot, 131; ear from notch in dried skin, 125.

Remarks.—W. H. Osgood recently examined the type of *californicus* in the British Museum, and found that it represents the extreme of the dark richly colored form belonging to the coastal slope of the mountains in middle and northern California.

San Antonio Mission and Jolon (near which the mission is located) are in a hot, arid interior valley, and specimens from there are all referable to the pale *richardsoni.* It is only a few miles west across the mountains from San Antonio to the coastal slope where the jack rabbits are typical dark colored *californicus*, and it is no doubt from there that Douglas secured the type of this species. In the coast mountains between the interior valleys and the coastal slope is the area of integradation between *californicus* and *richardsoni.* South of San Luis Obispo along the coast is an area of intergradation between *californicus* and *bennetti.* Specimens from Santa Maria, however, are nearly typical *californicus.* Specimens from localities in the mountains on the east side of Salinas Valley are referable to *californicus*, though paler than those from the coast. In the northern part of the San Joaquin Valley the area of intergradation between *californicus* and *richardsoni* is broad and extends to the basal slopes of the Sierra Nevada.

There is more than the usual amount of contrast between the summer and winter color of this form, due, as in other cases, to fading. The deep rich color of fall and early winter becomes gradually paler, and from spring until the new pelage is assumed in late summer or early fall, they are often scarcely distinguishable from winter specimens of the buffy gray *richardsoni*, and often do not differ from winter specimens of intermediates between the two. This fading extends even to the underparts, which become dull buffy or even buffy whitish. Summer specimens from the more humid parts of northern California are less faded than those from farther south. The contrast between the colors of winter and summer specimens is strikingly shown by series taken in both seasons at Marysville. Specimens from the Sacramento Valley, Point Reyes, and north to Humboldt County average larger, with heavier skulls and darker colors than from elsewhere in the range of true *californicus*, and represent the extreme development of this fine form. The most richly colored specimen examined was taken November 15 at Kings Peak, Humboldt County. A specimen from Comstock, Oregon, is nearly typical; others from Drain and Rogue River Valley, Oregon, are paler, and appear to be grading toward *wallawalla.*

Total number of specimens examined 124, from:

Oregon: Comstock, 1; Drain, 1; Grant Pass, 1; Rogue River Valley, 1.

California: Auburn, 1; Badger, 2; Baird, 1; Bear Valley, San Benito County, 3; Belmont, 1; Biggs, 1; Brentwood, 1; Briceland, 1; Carbondale, 3; Cassel, 2; Chico, 2; Chinese Camp, 3; Cloverdale, 2; Colusa, 6; Coulterville, 1; Elmira, 2; Fairfield, 1; Fort Reading, 1; Freestone, 1; Galt, 2; Garberville, 2; Glen Ellen, 2; Grafton, 1; Guenoc, 4; Hornbrook, 1; Jackson, 1; Kings Peak, 1; Laguna Ranch (Gabilan Mountains), 1; Laytonville, 3; Los Banos, 2; Marysville Buttes, 4; Merced, 1; Milton, 3; Modesto, 1; Morro, 2; Nelson, 1; Nicasio, 3; Oakdale, 3; Orland, 3; Paradise, 2; Paraiso Springs, 2; Payne Post Office, 1; Pennington, 1; Petaluma, 2; Petrolia, 1; Point Reyes, 4; Topo Valley (San Benito County), 2; Raymond, 2; Red Bluff, 7; Ripon, 2; Rocklin, 2; Round Valley, 1; St. Johns, 1; San Francisco, 1; San Luis Obispo, 3; Santa Monica, 2; Shasta Valley, 1; Tehema, 2; Valley Springs, 1; Wheatland, 3; Woodland, 1.

LEPUS CALIFORNICUS WALLAWALLA MERRIAM.

WASHINGTON JACK RABBIT.

Lepus texianus wallawalla Merriam, Proc. Biol. Soc. Washington, XVII, p. 137, July 14, 1904. Type from Touchet, Plains of the Columbia, Washington; No. $\frac{23823}{21521}$, ♀ ad., U. S. National Museum (Biological Survey collection); collected by C. P. Streator, September 18, 1890.

Geographic distribution.—Northeastern California, northwestern Nevada, and north through eastern Oregon and eastern Washington. Vertical range from about 1,000 feet in eastern Washington to 6,000 feet in northeastern California; zonal range mainly Upper Sonoran extending into lower part of Transition Zone.

General characters.—Most like *L. c. deserticola* but upperparts darker, more pinkish iron gray; legs darker, more pinkish buffy; sides of abdomen and underside of neck darker, richer buffy.

Color in fresh winter pelage.—Top of head and back nearly iron gray with a pinkish buffy suffusion; paler and less yellowish than *richardsoni* and darker gray than *deserticola;* sides of body paler or less washed with black than back and clearer buffy; sides of abdomen vary from dull buffy to dark buffy with a distinct suffusion of fawn color; rest of abdomen usually white but sometimes washed with buffy or dull ochraceous buffy, in latter cases buffy usually same shade as underside of neck; underside of head white; orbital area deeper and clearer buffy than back; rest of side of head paler or more grayish; nape varying from near isabella color to drab, darker than in *deserticola;* outside of ears on front half grayish brown, darker than *deserticola*, and more as in *richardsoni;* posterior half of ears white with a broad black tip; lower part of shoulders and outside of thighs similar to sides of abdomen but deeper colored; front of fore legs and tops of fore feet vary from dark buffy gray to deep cinnamon buff; outside of hind legs drab with a distinct tinge of fawn color; tops and sides of hind feet dingy whitish, distinctly underlaid and tinged with buffy brownish; outside of front and hind legs darker than in either *richardsoni* or *deserticola;* top of tail black; underside dingy buff or grayish buff; no rump patch.

Summer pelage.—Much paler or more bleached than in winter and thus approaching summer specimens of *deserticola* but darker.

Postjuvenal pelage.—Similar to adults but with overlying black wash on upperparts much less, thus giving a generally paler and more finely grizzled appearance.

Juvenal pelage.—Darker and browner than in *deserticola.*

Skull.—Scarcely distinguishable in size and general appearance from that of *deserticola* but bullæ smaller, less rounded; jugals broader; frontal region a little fuller and nearer plane of supraorbitals, thus giving a slightly more arched upper outline to rostrum; rostrum slender and supraorbitals small and light as in *deserticola.*

Average measurements (*5 adults*).—Total length, 581; tail vertebræ, 101; hind foot, 135; ear from notch in dried skin, 114.

Remarks.—This is a pale form most like *deserticola,* into which it intergrades in northern Nevada. In southwestern Oregon and northeastern California it grades into *californicus.* A young specimen from Cedarville, California, is as pale on the back as ordinary *deserticola,* but the legs are darker. Specimens from Dana and Beswick, California, and Umatilla, Oregon, are typical in color, but are rather larger than the specimens from the type region. The type from Touchet, Washington, is paler than average specimens, and thus more nearly approaches *deserticola.*

Total number of specimens examined 35, from:

Washington: Touchet, 2.
Oregon: Antelope, 1; Hay Creek, 6; Ontario, 2; Plush, 1; Prineville, 3; Tule Lake, 1; Umatilla, 1; Willow Junction, 1.
Idaho: Boise River, 1.
California: Bear Creek Valley (east of Dana), 1; Beswick, 2; Bieber, 1; Brownell, 1; Cedarville, 1; Cornell, 1; Dana, 2; Milford, 2; Montgomery Creek, 1; Pit River, 2; Sierra Valley (Beckwith), 1; Susanville, 1.

LEPUS CALIFORNICUS RICHARDSONI BACHMAN.

SAN JOAQUIN VALLEY JACK RABBIT.

(Pl. VII, fig. 2; Pl. VIII, fig. 2.)

Lepus richardsoni Bachman, Journ. Acad. Nat. Sci. Phila., VIII, pt. I, pp. 88–89, 1839. Type from California (exact locality unknown, but probably from near Jolon, Monterey County, near type locality of *californicus*); No. A586, Zoological Society collection, London (type no longer extant); collected by David Douglas in 1831.

Lepus tularensis Merriam, Proc. Biol. Soc. Washington, XVII, p. 136, July 14, 1904. Type from Alila, Tulare County, California; No. 126384, ♀ ad., U. S. National Museum (Biological Survey collection); collected by Luther J. Goldman, October 25, 1900.

Geographic distribution.—San Joaquin Valley, California, and adjacent arid valleys to the west and surrounding foothills. Vertical range from below 500 feet in Salinas Valley up to 4,000 feet in mountains about San Joaquin Valley; zonal range mainly Lower Sonoran, extending up through Upper Sonoran.

General characters.—Smaller than *californicus;* head and upperparts of body light yellowish or grayish buff, varying to a grayer color among intergrades with *californicus* and *deserticola.*

Color in fresh fall or winter pelage.—Head, back, and sides of body varying from grayish buff to sandy buff (dull cream buff of Ridgway) darkened on top of head and back by a light blackish wash, and shading down to a deeper buff along sides of abdomen, lower part of shoulders, and on inside of thighs; underside of neck still deeper, darker buff; underside of body buffy whitish shading into the buffy area along sides; underside of head white; nape pale, slightly buffy gray behind ears and becoming pale grayish drab or grayish isabella color along middle; front of fore legs similar to sides of body but darkened by a thin overlying blackish wash; tops of fore feet a little paler than fore legs; outside of hind legs similar to sides of body but tinged with fawn color; tops of hind feet pale buffy whitish; top of tail black, underside dull creamy buff; front half of ears on outside finely grizzled buffy gray, varying to sandy buff; posterior half white with well-marked black tips about an inch long; inside of ear in front fringed with dull gray or buffy grayish and posteriorly with a narrow edge of whitish near base and changing to rich buffy near tip; no rump patch.

Summer pelage.—Much paler than in winter, but nearly always with a distinctly yellowish tinge to upperparts.

Skull.—Smaller than that of *californicus*, and about intermediate between that form and *deserticola.* Compared with *californicus* the braincase is narrower, frontal area much more depressed below plane of supraorbitals; rostrum narrower at base, slenderer, and more flattened along upper outline; supraorbitals and jugals broader and heavier; bullæ actually and proportionately larger and more rounded.

Average measurements (*5 adults*).—Total length, 570; tail vertebræ, 97; hind foot, 125; ear from notch in dried skin, 112.

Remarks.—*Lepus richardsoni* was based on a specimen sent from California to the Zoological Society of London by David Douglas. Recent search in the British Museum proves that this specimen is no longer extant. For many years *Lepus richardsoni* was treated as a synonym of *L. californicus* or as unidentifiable. Doctor Merriam was the first author to fix definitely a type locality for this animal and to characterize it adequately.[a] Recent collections from the vicinity of San Antonio Mission, near where Douglas obtained the type of *californicus*, show that while the latter occupies the western or coastal slope of the adjacent mountains, a distinct and much paler animal lives in the hot, arid valley about the old mission. This last answers closely to the original description of *richardsoni* and thus justifies the assumption that the type of this form was obtained there. With a much larger series of specimens than was available when *Lepus tularensis* was described, it is now apparent that all of the pale jack rabbits of the upper Salinas and the San Joaquin valleys, and the similarly hot, arid valleys adjacent to them, must be referred to a single form, and *tularensis* thus becomes a synonym of *richardsoni*. Specimens from the bottom of the San Joaquin Valley, whence came the type of *tularensis*, represent the extreme of development of the pale form. They average smaller and have lighter, slenderer skulls than those from near the type locality of *richardsoni*. There is not much variation in color but a constant gradation in size between the smallest representatives of *richardsoni* in the south end of the San Joaquin Valley and the larger representatives from the borderline, where it approaches the range of *californicus*. A number of specimens from the type region of *richardsoni* are scarcely distinguishable in color from others collected in the bottom of the San Joaquin Valley, but they average distinctly nearer *californicus* in size.

There is much individual variation in this as in other forms of *californicus*. This is shown most in the winter pelage, in which some specimens from the bottom of the San Joaquin Valley are much deeper buffy than others. These, however, agree in size with the paler and more typical specimens from the same area. As would be expected there is intergradation in the jack rabbits on all sides of the San Joaquin Valley—into *californicus* on the north, east, and west, and into *deserticola* through Walker Basin, Tejon, and Tehachipi passes on the southeast and south. On the west the pale *richardsoni* style of color prevails among the majority of the jack rabbits over the low eastern foothills of the Coast Range and into the dry hot upper parts of the Cuyama, Salinas, and similarly situated valleys heading near the western side of the San Joaquin Valley. Owing to the breaking down of the Coast Range, *richardsoni* ranges west to within a few miles of the town of San Luis Obispo, where it passes into true *californicus*. The pale intermediate specimens from the border between the ranges of the last-named form and *richardsoni* are large and sometimes equal *californicus* in size. Intergradation in size and color into the larger and darker *californicus* takes place in the northern end of the San Joaquin Valley and along the lower slopes of the Sierra. Occasional specimens from the northern San Joaquin Valley are nearly dark enough to be called *californicus*, but are smaller, with shorter ears and smaller, lighter skulls, thus showing their identity with the paler individuals of the resident form.

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[a] Proc. Biol. Soc. Washington, XVII, p. 136, July 14, 1904.

Toward spring the fresh pelage gradually fades and loses most of the blackish wash on the upperparts until summer or late spring specimens become pale sandy yellowish or pale sandy buff slightly darkened by blackish on the back, and the ears become light sandy buff.

Total number of specimens examined 74, from:

California: Alcalde, 1; Alila, 19; Bakersfield, 3; Bitterwater, 1; Caliente, 2; Coalinga, 1; Cuyama Valley, 1; Delano, 1; Famosa, 3; Five Willow Springs, 1; Fort Tejon, 1; Fresno, 1; Huron, 6; Jolon, 3; Lemoore, 1; Milo, 1; Orosi, 1; Orris, 1; Paso Robles, 1; Pixley, 1; Porterville, 2; Poso, 1; Priest Valley, 1; San Emigdio, 1; San Luis Obispo (east of), 6; Santiago Springs, 1; Soledad, 1; Stanley, 2; Tehachapi, 2; Tejon Pass, 1; Tipton, 3; Tulare Lake, 2; Visalia, 1.

LEPUS CALIFORNICUS BENNETTI GRAY.

SAN DIEGO JACK RABBIT.

Lepus bennetti Gray, Zoology Voy. Sulphur, p. 35, pl. 14, 1844. Type from San Diego, California; No. 283a, Register 1842, British Museum; collected by Capt. Sir Edward Belcher.

Geographic distribution.—Southern California west of summit of Coast Range from near Gaviota Pass to Mexican border and south along the coast to San Quentin, Lower California. Vertical range from sea level at San Diego up to about 6,000 feet altitude in mountains to the eastward; zonal range mainly Upper Sonoran.

General characters.—Smaller than true *californicus*, with lighter skull. Color of upperparts paler, more grayish buffy brown; ears paler; upperside of feet brownish buffy.

Color in fresh winter pelage.—Top of head and back pinkish buffy, darkened by overlying black wash, producing a grayish buffy brown effect with a slightly pinkish tinge; sides of body with much less black wash than back and shading downward into dark buff, salmon buff, or dull ochraceous buff on lower flanks, lower part of shoulders, inside of thighs, and into a lighter shade of same over most of abdomen; underside of head whitish; underside of neck deep dark buffy or buffy fawn color; nape varies from grayish drab to cinnamon; front half of ears light buffy brown; posterior half white with a well-marked black tip smaller than in true *californicus;* tops of fore feet buffy fawn color darkened by blackish tips to hairs, like front of fore legs, and not distinctly more whitish as in *californicus;* tops of hind feet also more like adjoining part of legs; top of tail black; underside brownish buffy like sides of body; no rump patch.

Skull.—Similar to that of *californicus* but smaller and slenderer; jugals narrower; bullæ larger and more rounded; base of rostrum proportionately broad and heavy as in *californicus*, giving entire rostrum a massive form; frontal region more depressed below plane of supraorbital processes than in *californicus*, giving upper outline of rostrum a more flattened form; supraorbitals comparatively light and narrow as in *californicus.*

Average measurements (*5 adults*).—Total length, 556; tail vertebræ, 86; hind foot, 121; ear from notch in dried skin, 114.

Remarks.—This form is nearly as dark as *californicus* but much less ochraceous. Summer specimens are grayer and the ears grayer or paler grayish buffy than in *californicus* at the same season. The sides of the hind legs vary from dull drab to drab brown or buffy brown. *L. c. bennetti* has a more restricted range than most other forms of *californicus.* On the north it intergrades with *californicus*, on the east with *deserticola*, and on the south with *martirensis.* It is most like true *californicus*, with which it has long been confused.

Total number of specimens examined 29, from:

California: Alhambra, 1; Coast Range (summit on Mexican border), 1; Dulzura, 1; Elsinore, 1; Hueneme, 1; Jacumba, 1; Jamul Creek, 1; Laguna Mountains (San Diego County), 1; Mountain Springs (San Diego County), 1; National City, 4; Pacific coast near last mountains on Mexican border, 1; San Diego, 2; San Diego County (Monument 258 on Mexican boundary), 1; San Fernando, 2; Twin Oaks, 2; Winchester, 1.

Lower California (Mexico): Nachoguero Valley, 1; San Quentin, 6.

LEPUS CALIFORNICUS DESERTICOLA Mearns.

Colorado Desert Jack Rabbit.

Lepus texianus deserticola Mearns, Proc. U. S. Nat. Mus., XVIII, No. 1081, pp. 564–565, June 24, 1896. Type from western edge of Colorado Desert, at east base of Coast Range Mountains near Mexican boundary, San Diego County, California; No. $\frac{8308}{6642}$, ♀ ad., American Museum of Natural History; collected by F. X. Holzner, May 7, 1894.

Geographic distribution.—Arid desert areas of northeastern Lower California, east of San Pedro Martir and Laguna Hansen mountains, south to Calamahue Bay, and extreme northwestern Sonora in Mexico; and thence north through southeastern California (east of Coast Range and Sierra Nevada) at least to Mono Lake, through most of Nevada, except the northwestern part north of Pyramid Lake, most of Utah and southern Idaho, to Pahsimeroi Valley, and east to Phoenix and San Francisco mountains in Arizona. Vertical range from below sea level in the Colorado Desert to 7,500 feet in the border of the pine forest on the Mogollon plateau of northern Arizona, and to 9,000 feet in the San Bernardino Mountains, California; zonal range mainly Upper and Lower Sonoran.

General characters.—Slightly smaller than *californicus* with proportionately larger ears; colors very pale, upperparts ashy gray only a little darkened by black tips to hairs and sometimes tinged with pale buff; middle of abdomen white; sides of abdomen strongly buffy.

Color in fresh winter pelage.—Top of head and back pale ash gray, often almost whitish, only a little darkened by black tips to hairs, and often tinged with pale buff; sides of head and body paler than back; area about eyes pale buff or buffy white; front half of ears varies from grayish cream buff to pale buffy gray; posterior half of ears clear grayish white, usually with a rather poorly defined blackish patch about an inch long at tips (sometimes this patch nearly obsolete); the black area not strongly marked about border of ears at extreme tip, as in most other forms of this species; inside of ears bordered on front edges with a fringe of long whitish hairs, at tips by a narrow velvety border of buff, and along posterior edges with white; inside of ears brownish gray near posterior border and plain gray elsewhere; nape pale dull cinnamon varying to fawn color and pale grayish drab; top of tail and line down base of rump black; underside of tail dull, slightly yellowish, gray; lower part of shoulders and fore legs varying from pale buffy fawn color to pale dull pinkish buff; tops of fore feet vary from pale dull gray to yellowish white; an indistinct band along sides of abdomen and lower border of flanks dull vinaceous buff, sometimes varying to pale cream buff with a slight vinaceous tinge; back and sides of hind legs dull écru drab, shading into dull white, often tinged with dull buff on front of legs and tops of hind feet; underside of neck a little darker than fore legs and varying from pale buffy fawn color to vinaceous drab; rest of underside of body white, more or less strongly vinaceous buffy along border of flanks, as already noted; rump patch absent.

In worn and faded pelage the upperparts become more whitish and the buffy on sides paler.

Skull.—Small and slender, strikingly smaller than *californicus* and somewhat smaller than in *bennetti;* rostrum narrow at base and slender in form; frontal region flattened and upper outline of rostrum nearly straight; supraorbitals light and comparatively slender, as in *californicus;* jugals about the same in size but proportionately heavier; braincase proportionately broader; bullæ actually and proportionately much larger and more rounded.

Average measurements (5 adults).—Total length, 542; tail vertebræ, 88.4; hind foot, 122; ear from notch in dried skin, 124.

Remarks.—This is a pale desert form distinctly whitish or pale grayish on the upperparts and pinkish buffy along the sides of the abdomen. To the west, in southern California, *deserticola* intergrades with *bennetti* along the eastern part of the Coast Range and with *richardsoni* through Tejon and Tehachipi passes. Some winter specimens from the Mohave Desert closely resemble *richardsoni* in color, and a specimen taken in May at Salt Wells Valley on this desert is scarcely distinguishable in color of the upperparts from a specimen of *richardsoni* taken at Pixley in the San Joaquin Valley in January, but is more pinkish buffy along the sides of the abdomen. Specimens from Daggett, Hesperia, and other localities on the Mohave Desert have a heavier wash of black than most specimens in other parts of the range of *deserticola.* From the Colorado Desert, Death Valley, and Nevada they are distinctly whitish on the upperparts, and the black tips to the long hairs are so short that they form only a slight dark wash over the underlying pale grayish. The most whitish of all the winter specimens examined is an adult female taken in October at Ogden, Utah, and now in the Merriam collection. Summer specimens are paler and more bleached than those in winter fur. A series from the summit of the Coast Range in San Diego County, California, are intermediate between *deserticola* and *bennetti.* Others from the mouths of canyons at the east base of the San Pedro Martir Mountains and from Calamahue Arroyo in Lower California are darker than typical *deserticola* and are intergrades with *martirensis.* One Calamahue specimen taken in September has the black on the back of the ear reduced to a narrow rim about the tip. This specimen is an intergrade with *martirensis*, and has the upperparts buffy gray and the underparts dull ochraceous buffy. One skin from the Cocopah Mountains, Lower California, in faded spring pelage, has the black ear patch nearly obsolete. At Tinajas Altas, in southwestern Arizona, there is intergradation with *eremicus*, and specimens from there might be referred to both this form and *deserticola.* In northwestern Nevada *deserticola* grades into the closely related *wallawalla.* Typical examples of *deserticola*, *bennetti*, *richardsoni*, *wallawalla*, and *eremicus* are readily distinguishable, but the interminable series of intergrades between these forms, where their ranges touch, afford many specimens extremely difficult to place.

Several specimens from Loa, Wayne County, Utah, show two color phases; part of them are the typical pale gray on the upperparts, and the others are suffused with a pinkish buffy shade. These are good examples of the dichromatic phases which commonly occur among jack rabbits.

Total number of specimens examined 134, from:

California: Antelope Valley, 3; Banner, 1; Banning, 1; Brawley, 1; Coast Range Mountains (on Mexican boundary), 1; Colorado Desert, 2; Daggett, 1; Death Valley, 3; Furnace Creek, 1; Garlick Spring, 1; Goffs, 4; Hesperia, 1; Ivanpah, 2; Lancaster, 1; Lone Pine, 5; Long Valley, 1; Mohave, 1; Mohave Desert, east of Morongo Valley, 1; Mono Lake, 1; Mexican Boundary Monument 230, 1; Morongo Valley, 1; Onyx, 1; Oro Grande, 2; Owens Lake, 1; Owens Valley (Benton), 1; Palm Spring, 1; Panamint Mountains, 1; Providence Mountains, 1; Salt Well Valley, 1; San Felipe Valley, 5; Saratoga Springs, 1; Strawberry Valley (San Jacinto Mountains), 1; Tehachipi, 1; Vallecito, 6; Victorville, 3; Walker Basin, 1; Whitewater, 3.

Arizona: Beal Spring, 13; Beaver Dam, 1; Fort Whipple, 1; Kingman, 1; Phoenix, 2; San Francisco Mountain, 2; Texas Hill, 1; Tinajas Altas, 2.

Nevada: Battle Mountain, 1; Carson, 2; Fallon, 2; Gardnerville, 1; Grapevine Mountains, 1; Indian Creek, 1; Lovelocks, 2; Newark Valley, 1; Pahranagat Valley, 2; Pahrump Valley, 2; Paradise, 1; Vegas Valley, 1.

Utah: Beaver, 1; Beaver Hills, 1; Buckskin Valley, 1; Cave Fort, 1; Kelton, 1; Loa, 4; Nephi, 1; Ogden, 7; Provo, 1.

Idaho: Arco, 1; Blackfoot, 1; Sawtooth National Forest, 8.

Lower California (Mexico): Calamahue, 1; Cocopah Mountains, 1; Esperanza Canyon, 2; San Felipe Bay, 3.

LEPUS CALIFORNICUS EREMICUS ALLEN.

ARIZONA JACK RABBIT.

Lepus texianus eremicus Allen, Bull. Am. Mus. Nat. Hist., N. Y., VI, pp. 347-348. (Author's separates published December 7, 1894.) Type from Fairbanks, Cochise County, Arizona; No. $\frac{8034}{7327}$, ♀ ad., American Museum of Natural History; collected by W. W. Price and B. C. Condit, March 5, 1894.

Geographic distribution.—Northern Sonora (Hermosillo), Mexico, north throughout southern Arizona east of Phoenix and south of the high mountains; also along the border in southwestern New Mexico and extreme northwestern Chihuahua nearly to the Hachita Mountains. Vertical distribution from about 2,000 feet west of Tucson to 5,000 feet near Wilcox; zonal distribution mainly Lower Sonoran, extending up into lower part of Upper Sonoran Zone.

General characters.—Similar in size to *texianus;* color much paler and lighter than *californicus*, but darker and more buffy on upperparts and on sides of abdomen than *texianus;* ears browner and much darker, contrasting with color of back.

Color of winter pelage.—Top of head and back varying from dark cream buff to light pinkish buff strongly washed with black; the underlying dusky zone of color on tips of underfur, below the buffy ground color of the back, much darker in *eremicus* than in *deserticola* or *texianus*, darkens general color of back, especially in worn pelage; sides of head and body paler and less washed with black than upperparts, but darker than in *texianus;* nape dull, slightly vinaceous buff strongly washed with gray; front half of ears slightly grayish buffy, darker and browner than in *texianus*, and much darker than back; posterior half of ears clear white with a well-marked black tip an inch broad and forming a terminal black border; inside of ears bordered in front by a fringe of pale buff hairs and on posterior edge by a narrow border of velvety white; inside this white edge, color buffy brown like outside of ears; fore legs vary from dull pinkish buff to nearly ochraceous buff, shading into grayish white, grizzled with dusky on tops of fore feet; outside of hind legs varying from dull gray with a vinaceous tinge to dull grayish buff; underside of neck dark buff, sometimes with a slight vinaceous shade; along each side of abdomen and inside of thighs, and shading into color of flanks, a more or less well-marked band of buff usually present, but sometimes scarcely noticeable, nearly as in *texianus;* rest of underparts (underside of head and most of abdomen) white; no rump patch.

Skull.—Large and massive, nearly equaling *californicus* in size, but rostrum narrower at base, giving it a slenderer form throughout; frontal region only slightly more depressed, and upper outline of rostrum nearly as much curved; supraorbitals and jugals broader and heavier; molar series heavier; bullæ much larger and more rounded, proportionately larger than in *deserticola;* skull bearing a close general resemblance to those of *texianus*, *melanotis*, and *merriami.*

Average measurements (*5 adults*).—Total length, 595; tail vertebræ, 99.8; hind foot, 134; ear from notch in dried skin, 123.

Remarks.—This form has a comparatively restricted range, mainly in southern Arizona. It lacks a pale rump patch, and this, combined with its darker, more buffy colors, distinguishes it from *texianus.* The darker colors separate it from *deserticola.* The entire upperparts of typical specimens are nearly uniform dull brownish buffy, somewhat like *bennetti* in the pinkish brown tinge of the buffy, but are paler than that form. There is considerable individual variation. One specimen from Tucson, Arizona, is pale buffy gray on upperparts, much as in *texianus*, but is more heavily washed with black.

Total number of specimens examined 32, from:

Arizona: Agua Dulce, 1; Camp Grant, 1; Casa Grande, 1; Fairbanks, 1; Fort Bowie, 1; Fort Huachuca, 5; Fort Lowell, 3; Fort Verde, 3; Huachuca Mountains, 1; Lochiel, 1; Oracle, 2; Pinal County, 1; Rillito Creek, 1; east side Santa Rita Mountains, 1; Tucson, 2; Wilcox, 1.

New Mexico: 35 miles west of El Paso, 1.

Chihuahua (Mexico): Colonia Garcia, 1; San Bernardino ranch, 1.

Sonora (Mexico): Hermosillo, 1; Poso de Luis, 1; Santa Cruz, 1.

LEPUS CALIFORNICUS TEXIANUS WATERHOUSE.

TEXAS JACK RABBIT.

Lepus texianus Waterhouse, Nat. Hist. Mamm., II, p. 136, 1848. Type probably from western Texas; was in collection of Zoological Society of London (no longer extant).

Lepus texianus griseus Mearns, Proc. U. S. Nat. Mus., XVIII, No. 1081, pp. 554 and 562, June 24, 1896. Type from Fort Hancock, El Paso County, Texas; No. $\frac{21068}{36108}$, ♀ ad., U. S. National Museum; collected by Dr. E. A. Mearns, June 22, 1893.

Lepus (*Macrotolagus*) *texianus micropus* Allen, Bull. Am. Mus. Nat. Hist., N. Y., XIX, p. 605 (author's separates published November 12, 1903). Type from Rio del Bocas, northwest Durango, Mexico (altitude 6,800 feet); No. 21251, ♂ ad., American Museum of Natural History; collected by J. H. Batty, February 12, 1903.

Geographic distribution.—Northern Durango, Mexico, north through Chihuahua, arid western Texas (except northern Panhandle), New Mexico (except northeastern part), northeastern Arizona (valley of Little Colorado River), and southwestern part of Colorado. Vertical range from about 1,500 feet above Del Rio, Texas, to 7,500 feet altitude on mountains of New Mexico; zonal range mainly Upper Sonoran, but extending down into Lower Sonoran and up in summer into lower border of Transition Zone.

General characters.—A large, long-eared, light-colored form about the size of *eremicus* but much paler; the upperparts pale buffy gray darkened by a light overlying wash of black and with a fairly well-marked whitish gray rump patch, underside of body white, with only slight traces, if any, of buffy along sides of abdomen.

Color in fresh pelage.—Top of head and back pale slightly buffy gray, usually darkened a little by a thin overlying wash of black, the buffy tinge varying from pale creamy to pale pinkish buffy; sides of head and body grayer, being paler and without the black wash of the back; rump paler and more grayish white than back, forming a fairly well-marked rump patch; middle of rump and top of tail marked by a strong black line; underside of tail whitish or whitish gray; front half of ears rather dark buffy gray varying to grayish buffy, nearly always darker than back; posterior half of ears pure white with a well-marked black tip about an inch long and a narrow black border extending around rest of tip; the lower border of black tip usually ends abruptly against white area of ear, though sometimes with indications of a narrow buffy area intervening, especially in some specimens from southwestern Colorado; border of ear along front of inside dull buffy, and posteriorly satiny white, changing to buff or ochraceous buff next to black border about tip; nape varying from drab to écru drab and light fawn color, overlaid with gray tips of hairs; fore legs vary from dull buffy or buffy gray to pale dull grayish fawn color, sometimes with a vinaceous tinge; tops of fore feet lightly grizzled with dusky and varying in general shade from pale dull buffy gray to rather dark dull gray and to dark dull buffy; back and outside of lower hind legs vary from dull vinaceous gray to drab gray; tops of hind feet whitish; underside of neck usually dark colored, varying from rich fawn color to cinnamon fawn color and dull slightly pinkish drab.

Worn pelage.—The pelage of upperparts first bleaches to a paler more whitish gray and then wears down to the dusky brownish of the underfur, when the color becomes much darker and strikingly different in appearance from the pale freshly pelaged specimens.

Skull.—Slightly smaller than in *californicus* and agreeing closely with that of *eremicus*, from which it differs in its slenderer rostrum, more flattened and depressed frontal region, and less curved upper outline to rostrum; supraorbitals similar; jugals broader and heavier; bullæ a little smaller. The bullæ and supraorbitals in specimens from the region near El Paso, Texas, average larger than from elsewhere in the range of *texianus*.

Average measurements (5 adults).—Total length, 606; tail vertebræ, 85; hind foot, 133; ear from notch in dried skin, 123.

Remarks.—The original locality of the type of *Lepus texianus* was not known, but on the strength of a statement by J. W. Audubon that it was the same as a species from Texas soon to be described under that name by Audubon and Bachman in the Quadrupeds of North America, Waterhouse accepted the name and habitat for his species. A careful reading of the description of *L. texianus* Audubon and Bachman,[a] especially the statement that one of their specimens had a black patch on the posterior base of each ear and the other one a brown patch in the same places, shows conclusively that they had in hand not the *L. texianus* of Waterhouse but the animal since called *Lepus merriami.* The Audubon and Bachman specimens were probably collected by J. W. Audubon, whose travels in Texas during his two visits in 1845 and 1849 were almost wholly within the known range of *L. merriami.*

Unfortunately the type of *L. texianus* Waterhouse appears to have been lost, since there is no record of its receipt by the British Museum with the rest of the Zoological Society collection and no trace of it can be found. The original description of *texianus*, however, fits the animals of arid west Texas so closely that there is little doubt the name belongs there. West Texas may thus be considered the type region of *Lepus texianus* Waterhouse.

Texianus is the palest and least buffy of any of the forms of *californicus* except *deserticola;* it is even paler than the latter on the underparts, owing to the smaller amount of buffiness along the sides of the abdomen. The pale gray rump patch divided by the black line from the tail is one of its strongest characters. Summer specimens of typical *texianus* are often distinctly pale gray, almost as in *deserticola*, but may be distinguished by the darker ears and legs, the whiter underparts, and the pale rump patch.

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[a] Quadrupeds of North America, III, pp. 156–159, 1854.

It is a wide-ranging form, and in addition to the usual amount of individual variation there is the geographic variation shown by gradation toward the neighboring subspecies. A specimen from 35 miles west of El Paso, Texas, is nearly typical *eremicus*, though most specimens from that district evidently are *texianus*. Specimens from Silver City, New Mexico, and from Springerville, Holbrook, and the Painted Desert, Arizona, are slightly yellower than true *texianus*, but their pale colors and whitish rump patch show that they belong to this form though grading toward *eremicus*. One individual taken November 5 at Tularosa, New Mexico, is much darker pinkish buffy than typical *texianus*, with darker gray on outside of hind legs and rump patch, and the fore feet more dusky. But for the rump patch this might pass for a specimen of *eremicus*. Others from Mesa Jumanes, Ancho, and Roswell, New Mexico, have a still brighter buffy shade, and are evidently grading toward *melanotis*. This gradation toward *melanotis* is distinctly shown by specimens from north central and eastern Texas. Specimens from all west Texas to El Paso and south into the adjacent parts of Chihuahua, Mexico, are usually typical. In southern Chihuahua there is an average heavier wash of black on the back, but many specimens, especially from northern Durango, are typical in color. The Durango specimens have larger ears than those from Texas, thus grading toward *asellus*. The darkest colored series is from Santa Rosalia, southern Chihuahua, among which the upperparts have more of the buffy tinge than usual in addition to the heavier black wash. This is an example of the kind of local variation that occurs sporadically within the range of all the widely spread subspecies of American rabbits. Winter specimens from southwestern Colorado usually average lighter colored than from most of the range of *texianus*, but when they are placed with a series from western Texas and from northern Durango, it becomes evident that they are not distinguishable in any way from a large proportion of typical specimens from those areas.

In south Texas, from near the mouth of the Pecos River southeast to Falls County, lies the belt of intergradation between *texianus* and *merriami*. From middle Falls County, Texas, northwesterly extends the belt of intergradation between *texianus* and *melanotis*. A single specimen in the Biological Survey collection from Antioch, Houston County, in faded summer pelage, is very pale, but I have referred it to *merriami*. It was taken on an isolated prairie in the wooded area, and this individual was reported to be the last of the colony which once lived there.

In northeastern New Mexico and north along both sides of the Rocky Mountains in Colorado is a belt in which most of the jack rabbits are evidently intergrades between *texianus* and *melanotis*, being more buffy than the former but paler than the latter. A scalp in the Warren collection, from Norwood, San Miguel County, southwestern Colorado, taken the 1st of May, has much buffy yellow on the ears as in *melanotis;* more than half of a series of ten specimens collected in winter at Coventry, in the same section of the State, have a distinctly yellowish buffy tinge to the upperparts and broad buffy areas on the backs of the ears, thus being an almost exact intermediate between the pale specimens of *melanotis* from eastern Colorado and typical *texianus*. The great majority of the series examined from southwestern Colorado are of the gray *texianus* style. Occasional individuals occur in various parts of its range which are much darker and more buffy than ordinary, and closely resemble typical *eremicus*. One such example is in the Survey collection from Winslow, Arizona. The body is dark buffy with a heavy wash of black on the back and a well-marked buffiness along the sides of the abdomen. Similar individuals have been examined from near El Paso, Texas, and various places in southern New Mexico, where the paler *texianus* is the ordinary resident form. Such specimens merely represent extreme cases of individual variation, but are very puzzling when attempts are made to identify them without proper knowledge of their true relationships.

Total number of specimens examined 186, from:

Colorado: Bayfield, 1; Coventry, 10; Fort Lewis, 1; Albaugh's ranch (Montezuma County), 1; Norwood, 1.

Texas: Alpine, 1; Belem, 1; Chisos Mountains, 1; Colorado, 3; Comstock, 1; El Paso, 5; Fort Davis, 2; Fort Hancock, 1; Fort Lancaster, 1; Fort Stockton, 1; Franklin Mountains, 2; Haymond, 2; Langtry, 1; Llano Estacado (near 32° north latitude), 1; Marathon, 2; Monahans, 1; Sierra Blanca, 1; Samuels, 1; Stanton, 2; Strickland Spring, 1; Terlingo Creek, 1; Toyah, 1; Valentine, 1; Van Horn, 1.

New Mexico: Acoma, 1; Ancho, 1; Animas Valley, 1; Aztec, 1; Burro Mountains, 1; Canyon Blanco, 2; Capitan Mountains, 4; Carlsbad, 1; Carrizalillo Springs, 1; Carrizozo, 1; Chamberino, 2; Deming, 5; Dog Spring (Grant County), 3; Elk Mountains, 1; Fort Wingate, 1; Fruitland, 2; Grants, 1; Guadalupe Mountains, 1; Guadalupe ranch, 9; Jarilla, 1; Jicarilla Mountains, 3; La Mesa, 4; Lordsburg, 2; Mesa Jumanes, 2; Mexican boundary line (long. 30° 15′ W.), 3; Mexican boundary (Monument 40, west of El Paso), 1; 15 miles west of El Paso, 1; Hatchita, 3; head of Mimbres River, 2; Organ City, 1; Otero County (between Alamagordo and Dry Canyon), 1; Redrock, 2; Roswell, 2; Salt Valley (west of Guadalupe Mountains), 1; Near Bear Canyon, east side San Andres Mountains, 2; Silver City, 1; Tularosa, 1.

Arizona: Holbrook, 1; Painted Desert, 1; Springerville, 6; Winslow, 13.
Chihuahua (Mexico): Casas Grandes, 2; Chihuahua City, 1; Guzman, 2; Mesquite Spring (near Mexican boundary line), 1; Pacheco, 1; San Bernardino ranch, 4; San Luis Mountains, 1; Santa Rosalia, 8; Stillwater, 4.
Durango (Mexico): Rancho Ballon, 10; Rancho Santuario, 2; Rio Campo, 1; Rio del Bocas, 6; Rio Sestin, 1.

LEPUS CALIFORNICUS MELANOTIS MEARNS.

GREAT PLAINS JACK RABBIT.

Lepus melanotis Mearns, Bull. Am. Mus. Nat. Hist., II, No. 4, pp. 297–303, February, 1890. Type from border of Indian Territory [now Oklahoma], near Independence, Montgomery County, Kansas; No. 2422, ♂ ad., American Museum of Natural History; purchased in market, New York City, by Dr. E. A. Mearns, January 27, 1890.

Geographic distribution.—Great Plains from east central and northern Texas, northeastern New Mexico and north through western half of Indian Territory, all of Oklahoma, extreme southwestern part of Missouri, all of Kansas and Nebraska, except perhaps extreme eastern parts, southwestern Dakota, southeastern Wyoming, and all of Colorado east of Rocky Mountains. Vertical range from less than 1,000 feet near Independence, Kansas, to over 6,000 feet on east base of mountains in Colorado; zonal range mainly Upper Sonoran.

General characters.—Upperparts deep bright ochraceous buffy, varying to light bright ochraceous buffy; inside of ears near tip usually rich buffy; gray rump patch large and conspicuous; underside of neck richly colored, varying from deep vinaceous buff to deep ochraceous buff.

Color in fresh winter pelage.—Top of head and most of upperparts of body bright ochraceous buffy, varying in shade and darkened by a blackish wash; sides of body with much less overlying blackish than back, and paler, clearer buff; underside of head and body bright clear white; underside of neck a brighter, richer color than in any other form of this group, varying from rich bright ochraceous buff to rich cinnamon buff, or buffy fawn color, in strong contrast to rest of underparts; rump covered with a large conspicuous patch of whitish or pale gray, more strongly marked and contrasted with color of upperparts than in any other form of *californicus;* middle of rump divided by a broad black band extending out over upperside of tail; underside of tail white or grayish white; nape deep buff with a wash of whitish on tips of hairs in fresh pelage but soon wearing off; outside of ears on front half more or less strongly buffy, sometimes with a grayish tinge; posterior half of ears white with a short black patch at tip, the black area generally followed by a more or less well-marked buffy border at lower end next the white;

inside of ears mainly deep buffy, most intense near tip, with a narrow velvety white border along posterior edge, well-marked black border about tip, and dusky or brownish buffy border posteriorly; front of fore legs and tops of fore feet buffy, similar to sides of body but a little darker and duller; outside of hind legs duller and more grayish buffy than sides of body and darker than rump patch; front of hind legs and tops of hind feet pure white.

Skull.—Scarcely distinguishable in size and proportions from that of *eremicus* except by the much smaller and less rounded bullæ and rather narrow jugals; uppersides of skulls of *melanotis* and *eremicus* practically the same; the skull also closely resembles those of *merriami* and *texianus*, but the bullæ decidedly smaller.

Average measurements (5 adults).—Total length, 582; tail vertebræ, 80; hind foot, 131; ear from notch in dried skin, 104.

Remarks.—The preceding description applies to the richly colored typical *melanotis* from the semihumid border of the plains in eastern Kansas. In the more arid regions of western Kansas, Nebraska, and Colorado, to the east base of the Rocky Mountains, all of the specimens examined are rather paler and more grayish ochraceous buffy, the rich ochraceous or ochraceous pinkish tinge seen in typical specimens being almost or entirely lacking. The ears of these western specimens are paler than in true *melanotis*, but more strongly buffy than in either *texianus* or *eremicus.* Specimens from Pendennis, Kansas, are pale like those of Colorado, and among a fine series of typical *melanotis* from Onaga, Kansas, is one pale individual like those from Pendennis.

To the south, in northeastern New Mexico and through northern and eastern Texas, there is a steady gradation into the paler and grayer *texianus* and grayer *merriami.*

One example in the Burnett collection taken the middle of January at Spring Canyon, Larimer County, Colorado, is very gray (though but little paler than some individuals from Pendennis, Kansas) and in general appearance closely approaches *texianus.* The upperparts, including head and ears, are pale grayish, with a yellowish buffy suffusion, and the underside of the neck is pale ochraceous buffy. There is enough yellowish buffy, however, to place this specimen, with others from the east base of the Rocky Mountains in Colorado, with *melanotis.* A specimen from the northwestern part of Oklahoma is even paler and almost pale enough to be referred to *texianus.*

L. c. melanotis extends south to middle eastern Texas, where it grades into *merriami.* Traces of the bright ochraceous buffy so characteristic of *melanotis* are very evident in a number of the specimens from along the extreme eastern border of the range of *merriami* in the coast region of southeastern Texas. There is also considerable of the same buffiness, especially on the ears of specimens representing *tex-*

ianus from Coventry in southwestern Colorado. In both these cases this buffiness is evidently due to intergradation. Traces of the same thing are evident in specimens from the intermediate territory of northeastern New Mexico.

Total number of specimens examined 89, from:

Colorado: Arlington, 1; Burlington, 1; The Cedars (Baca County), 1; Colorado Springs, 4; Colorado Springs Canyon, 1; Denver, 1; Lamar, 1; Monon, 1; Peyton, 1; Semper, 1; Springfield, 1; Wray, 3.
New Mexico: Clayton, 1; Santa Rosa, 1.
Texas: Canadian, 1; Golinda, 1; Henrietta, 2; Lipscomb, 2; Saginaw, 1; Texline, 1; Vernon, 2; Washburn, 2.
Oklahoma: Alva, 8; Bear River, 2; Mount Scott (Wichita Mountains), 1; Neutral Strip, 2; Red Fork (8 miles west of), 4.
Kansas: Cairo, 4; Independence, 8; Long Island, 7; Onaga, 12; Pendennis, 2; Lawrence, 2; Trego County, 3; Wakeeney, 4; Wichita, 3.
Missouri: Stotesbury, 1.

LEPUS CALIFORNICUS MERRIAMI MEARNS.

MERRIAM JACK RABBIT.

Lepus merriami Mearns, Preliminary Diagnoses of New Mammals from the Mexican Border of the United States, p. 2, March 25, 1896 (advance sheets of Proc. U. S. Nat. Mus., XVIII, No. 1075, p. 444, May 23, 1896). Type from Fort Clark, Kinney County, Texas; No. 83797, ♀ ad., U. S. National Museum (No. 2317, collection International Boundary Commission); collected by Dr. E. A. Mearns, April 6, 1893.

Geographic distribution.—All of southern Texas from coast prairies near Trinity River west to a little above Del Rio on the Rio Grande, north to Mason and Antioch, and south across the Rio Grande through northern parts of Tamaulipas, Nuevo Leon, and Coahuila, Mexico. Vertical range from sea level southern Texas up to about 5,000 feet in mountains of Coahuila, Mexico; zonal range mainly Lower Sonoran and into lower border of Upper Sonoran in Coahuila, Mexico.

General characters.—Size large; upperparts dark brownish buffy; color of head and back much like unusually dark specimens of *eremicus;* nape in typical examples entirely black or with a black band extending back from base of each ear (in specimens from northern and eastern border of range black on nape commonly much reduced or absent); rump and hind legs iron gray, contrasting with back; underparts pure white.

Color in fresh winter pelage.—Top of head and back varying from dark cream buff to rich pinkish buff, heavily overlaid with black on tips of hairs, thus producing a generally brownish buffy shade; nape entirely black or with a line of buffy brown down middle, dividing the black into two long patches extending from posterior bases of ears back over neck; sometimes the black confined to a limited patch on base of each ear, in latter case rest of nape brownish buffy or, in specimens from northern and eastern border of range, black of nape replaced by brownish or buffy; front half of ears varies from deep buffy to grayish buffy; posterior half white with a well-marked black patch at tip, varying from one-third of an inch to an inch broad, and extending around margin as a narrow, poorly marked border; inside of ears edged along front with a fringe of dark ochraceous buff hairs and posteriorly by a narrow border of satiny white, shading into rich buff about tip; inside of ears near posterior border like front half of outside; rump and outside of hind legs iron gray, forming a distinct rump patch; tops of hind feet white; upper side of tail black, the black extending up rump as a strong median line; underside of tail dull dark gray; front of fore legs and tops of feet dull buffy gray, more or less strongly grizzled with dusky and sometimes strongly washed with dusky brown; underside of neck rich pinkish buff; rest of underparts pure white.

Skull.—Practically indistinguishable from that of *texianus* and much like those of *eremicus*, *melanotis*, and *asellus;* differs from *californicus* in its more massive form with higher arched upper outline, especially over the middle; rostrum heavier at base; shorter and stouter in general form; occipital outline more strongly arched; jugal broader and heavier; molar series heavier.

Skulls from the Gulf coast region, Brownsville, Padre Island, East Bernard, and Houston are smaller, with smaller bullæ than those from the type region, but are otherwise similar.

Average measurements (*5 adults*).—Total length, 592; tail vertebræ, 96.8; hind foot, 128; ear from notch in dried skin, 114.

Remarks.—The considerable series of specimens examined from all parts of the wide range of *merriami* show that it is subjected to much geographic variation. From Fort Clark, Texas, the type locality, southward there is little change of color, but the ears increase in length until in southern Coahuila on the Mexican Tableland it grades into the larger and longer eared *asellus.* From Fort Clark eastward there is a decrease in the length of the ears, until along the Gulf coast of Texas (including Padre Island) and northeastern Mexico they become distinctly shorter. This decrease in length of ears eastward is accompanied by a decrease in size of bullæ, a general increase in amount of buffiness, and, toward the eastern border of the range, a distinct decrease in amount of black on the neck. The shorter ears, increasing buffiness, and decrease of black on the nape in specimens from the district about Houston and East Bernard, Texas, is direct gradation between typical *merriami* and *melanotis.* The black nape is the strongest character of typical *merriami*, but it is lost along the extreme northern and eastern border of its range in Texas. On the north from Mason to Antioch the black on the nape becomes practically lost, and is replaced by brownish buff. Three specimens from

Mason and six out of seven from Houston are without black on the nape, though in general color and other characters they are referable to *merriami*. One specimen from Houston has a small black patch on the posterior base of each ear with a dusky streak extending back from it along the nape. A series from East Bernard, Wharton County, a little west of Houston, have the black on the nape sometimes represented by a well-marked patch, but often reduced to a small blackish or even a small brownish patch at the base of the ears.

A considerable series from San Antonio, Texas, has been examined, and, while evidently referable to *merriami*, many specimens show distinct gradation toward *texianus*. The black on the nape is nearly always divided by a median buffy or buffy gray band, although this band is sometimes very narrow. One specimen has nearly all the nape dull buffy with a limited dusky or blackish patch on the posterior base of the ears and extending back as a decreasing narrow stripe along the front part of the nape. Other specimens have strongly marked broad parallel black bands beginning on the bases of the ears and extending back the entire length of the nape. The upperparts of the head and body of the San Antonio specimens is not as dark as typical *merriami* but distinctly darker than *texianus*. A February specimen from Turtle Creek, Kerr County, is the same in the color of the upperparts as those from San Antonio, but the nape is plain buffy gray on the surface, underlaid with dusky brownish underfur. This specimen is almost an exact intermediate between *merriami* and *texianus*. It is much larger than ordinary specimens of either, with a large, massive skull. In the flesh it weighed 8 pounds.

Total number of specimens examined 124, from:

Texas: Alice, 1; Antioch, 1; Brazos River, 1; Brownsville, 7; Corpus Christi, 3; Cotulla, 2; Cuero, 5; Del Rio, 3; Dos Hermanos, 1; Eagle Lake, 1; Eagle Pass, 2; East Bernard, 11; El Sauz, 1; Fort Clark, 14; Guadalupe, 1; Houston, 9; Llano, 1; Lott, 4; Mason, 3; Matagorda, 2; northwest Kerr County, 1; Padre Island, 3; Port Lavaca, 1; Rockport 6; Roma, 1; San Antonio, 18; San Diego, 1; Seguin, 1; Turtle Creek, Kerr County, 1; Victoria, 5.

Tamaulipas (Mexico): Camargo, 2; Matamoros, 3; Mier, 1; Nuevo Laredo, 1.

Nuevo Leon (Mexico): Lampazos, 2; Santa Catarina, 2.

Coahuila (Mexico): Monclova, 1; Sabinas, 1.

LEPUS CALIFORNICUS ASELLUS Miller.

San Luis Potosi Jack Rabbit.

Lepus asellus Miller, Proc. Acad. Nat. Sci. Philadelphia, pp. 380-381, October, 1899. Type from San Luis Potosi, Mexico; No. [illegible], ♀ ad., U. S. National Museum; collected by P. L. Jouy, October 22, 1891.

Geographic distribution.—Central eastern part of Mexican Tableland from southern Coahuila, Nuevo Leon, and extreme western

Tamaulipas southwest through San Luis Potosi, Zacatecas, and Aguas Calientes to northeastern Jalisco. Vertical range from about 3,500 to 7,500 feet altitude in San Luis Potosi; zonal range, Upper and Lower Sonoran zones.

General characters.—Like *merriami* but with much larger and grayer ears.

Color in all pelages.—General coloration the same as in typical *merriami*, but ears less buffy and grayer; hind legs a little browner and tops of hind feet grayer.

Skull.—Scarcely distinguishable from *merriami* and *texianus*, but averaging a little larger with larger bullæ and broader jugals; basioccipital long and narrow.

Average measurements (5 adults).—Total length, 589; tail vertebræ, 75; hind foot, 126; ear from notch in dried skin, 124.

Remarks.—The type of *asellus* was described erroneously as having a gray nape. This was due to the make-up of the skin, in which the nape is drawn into a fold in such a way that the black area is completely hidden, but it can be found by manipulating the skin. That the black nape is fully as conspicuous in this form as in true *merriami* is shown by the considerable series from the district about the type locality in the Biological Survey collection.

Total number of specimens examined 25, from:

Coahuila (Mexico): Carneros, 1; Encarnacion, 1; Jaral, 1; La Ventura, 2; Saltillo, 2.
Nuevo Leon (Mexico): Miquihuana, 3.
San Luis Potosi (Mexico): Arenal, 1; Hacienda La Parada, 1; Rio Verde, 1; San Luis Potosi, 4.
Aguas Calientes (Mexico): Chicalote, 3.
Zacatecas (Mexico): Berriozabal, 2; Calera, 1; Cañitas, 1; Valparaiso, 1.

LEPUS CALIFORNICUS FESTINUS Nelson.

Hidalgo Jack Rabbit.

Lepus festinus Nelson, Proc. Biol. Soc. Washington, XVII, p. 108, May 18, 1904. Type from Irolo, Hidalgo, Mexico; No. 53490, ♂ ad., U. S. National Museum (Biological Survey collection); collected by E. W. Nelson and E. A. Goldman, March 31, 1893.

Geographic distribution.—Southeastern part of Mexican Tableland in States of Tlaxcala; northern Puebla; Hidalgo; northern part of State of Mexico; Queretaro; Guanajuato; and probably northeastern Jalisco. Vertical range from about 6,000 to 8,500 feet in Hidalgo; zonal range mainly Upper Sonoran, extending into upper border of Lower Sonoran Zone.

General characters.—Color of upperparts dull brownish buffy, much like *eremicus* but back a little darker; gray rump patch more strongly marked than in *texianus;* ears longer and darker, or more buffy brown, than in either *texianus* or *eremicus;* fore legs dull buff and hind legs gray like rump; underparts white; ears longer than in any other form of *californicus* except *martirensis.*

Color in winter pelage.—Top of head and back pinkish buff varying to creamy buff, heavily overlaid or washed with black as in darkest specimens of *eremicus;* sides of head and body grayer and less washed with black than back; rump with sides and back of hind legs distinctly gray, sometimes clear iron gray; line down middle of rump and all top of tail black; underside of tail dull gray; nape varies from dusky to dull buffy fawn color always washed with gray; front half of ears dark grayish buff or buffy brown, much darker than back; posterior half of ears grayish white with a broad black tip about an inch wide, the black extending as a narrow border about tip of ears; inside of ears gray, fringed along front edge with long dull buffy hairs, and broadly bordered posteriorly with a band similar in color to front half of outside; posterior border narrowly edged with velvety white; front of fore legs and tops of fore feet dull buffy or buffy drab; hind legs and sides of feet gray like rump; tops of hind feet paler, often whitish; underside of neck varying from buffy drab to rich deep buff; rest of underparts white.

Skull.—Resembles in general shape and proportions the skulls of *texianus*, *merriami*, and *asellus*, but much smaller and lighter, with rostrum lighter and more tapering; supraorbitals and jugals lighter; braincase more inflated; basioccipital small and bullæ smaller.

Average measurements (*5 adults*).—Total length, 552; tail vertebræ, 77.4; hind foot, 124; ear from notch in dried skin, 129.

Remarks.—The present subspecies is the extreme southern representative of *californicus* and extends the range of the species south to the Valley of Mexico. It has a gray nape and thus is more nearly like *texianus* or *eremicus* in color than like *merriami* and *asellus.*

Total number of specimens examined 9, from:

Hidalgo (Mexico): Irolo, 1; Pachuca, 1; Tulancingo, 3; Zimapan, 2.
Queretaro (Mexico): Tequisquiapam, 2.

LEPUS CALIFORNICUS MARTIRENSIS STOWELL.

SAN PEDRO MARTIR JACK RABBIT.

Lepus martirensis Stowell, Proc. Calif. Acad. Sci., ser. 2, V, pp. 51–52, Pl. III (author's separates issued May 28, 1895). Type from La Grulla Meadows, San Pedro Martir Mountains, Lower California, Mexico (7,000 feet); No. 748, ♂ ad., Stanford University Museum; collected by J. M. Stowell and S. C. Lunt, June 30, 1893.

Geographic distribution.—Middle Lower California, Mexico, from San Rafael Valley, and southern part of the Laguna Hansen Mountains, south through San Pedro Martir Mountains to La Purisima in the interior, and along both coasts of the peninsula from San Simon

River to Scammon Lagoon on the Pacific side, and from Calamahue Bay to Muleje on the Gulf coast. Vertical range from sea level at San Quentin to 7,000 feet altitude in the San Pedro Martir Mountains; zonal range from Lower Sonoran up through Upper Sonoran and into the Transition Zone.

General characters.—Size of *californicus*, but with much larger ears; color of upperparts nearly iron gray with a slight buffy suffusion; ears and head much grayer than in *californicus;* underparts deep pinkish buff, almost a dark salmon color.

Color in winter pelage.—Top of head and body rather dark gray, tinged with buff and heavily overlaid with black on tips of hairs, giving almost an iron-gray color; sides of nose and cheeks clearer gray; eyes surrounded by a ring of white or bright buff; nape dingy drab; front half of ears dark gray with a slight shade of buffy, and fringed on anterior border by long hairs varying from gray to cinnamon buff; posterior half of ears grayish white with a broad well-marked black patch at tip an inch long; posterior border of ear on inside narrowly edged with velvety white, with an area of buffy brown just inside this, and rest of inside of ear dull gray; top of tail and line up middle of rump black; tail on underside dull buffy fawn color; sides of body grayer and washed with less black than back, and shading into color of underparts; latter varying from deep pinkish buff (often salmon color) to fawn color, with a band of paler along middle of abdomen; underside of neck darker and deeper buff than rest of underparts, nearly dull fawn color; tops of fore legs between wood brown and fawn color, darkened by short black tips to hairs; feet similar to legs but fade to dull grayish buffy in worn pelage; hind legs drab, with a vinaceous tinge; front of hind legs and tops of hind feet dull buffy gray, blackish between toes.

Worn pelage.—Upperparts of body dingier gray and legs and underparts paler, the latter fading to dull yellowish buff; underside of neck dull buffy fawn color.

Postjuvenal pelage.—The nearly grown young with top of head and back dark ashy gray; sides of head and body clearer gray and underparts of body whitish, becoming more or less buffy about legs; underside of neck buffy fawn color varying to vinaceous drab; tops of feet buffy gray to whitish.

Skull.—Slightly shorter and much more slender than *californicus;* braincase and base of rostrum much narrower, rostrum long and slender, with upper outline flattened; nasals long and narrow; frontal region strongly depressed below plane of broad, heavy supraorbitals; jugals averaging a little heavier than in *californicus* and bullæ strikingly larger and more rounded.

Average measurements (5 adults).—Total length, 568; tail vertebræ, 95.8; hind foot, 125; ear from notch in dried skin, 131.

Remarks.—This subspecies occurs mainly in the desert middle parts of the peninsula. Specimens from Rancho San Antonio, inland from San Quentin, at the west base of the San Pedro Martir Mountains, and from Playa Maria Bay are intermediate between *martirensis* and *californicus*. At Calamahue Arroyo they intergrade with *deserticola*, and at San Ignacio and San Bruno approach *xanti*. At La Grulla Meadow, in the San Pedro Martir Mountains, they live in the open pine forest.

Total number of specimens examined 45, from:

> Lower California (Mexico): Calamahue, 3; Calmalli, 2; Jaraguay, 1; La Grulla, 3; La Huerta, 1; Playa Maria Bay, 1; Rancho La Progresa, 4; Rancho San Antonio, 1; Rancho San José, 2; Rancho Santo Tomas, 3; Rancho Viejo, 7; Rosarito, 3; San Bruno, 2; San Fernando, 2; San Ignacio, 1; San Luis Gonzales Bay, 1; San Matias Pass, 1; San Simon, 6; Yubay, 1.

LEPUS CALIFORNICUS MAGDALENÆ NELSON.

MAGDALENA ISLAND JACK RABBIT.

Lepus californicus magdalenæ Nelson, Proc. Biol. Soc. Washington, XX, p. 81, July 22, 1907. Type from Magdalena Island, Lower California, Mexico; No. 146168, ♂ ad., U. S. National Museum (Biological Survey collection); collected by E. W. Nelson and E. A. Goldman November 26, 1905.

Geographic distribution.—Magdalena and Margarita islands, near southern end of Lower California, Mexico. Vertical range from sea level to about 1,000 feet altitude; zonal range Lower Sonoran.

General characters.—Upperparts buffy brown, most like *L. c. xanti*, but more lightly washed with black, and general colors both above and below paler; front of ears grayer and back of ears, especially on basal half, much whiter; ears decidedly shorter.

Color in fresh winter pelage.—Top of head, back, and sides of body, pale pinkish buff, washed with black on head and back, but with only slight traces of black wash on sides of body; sides of head dull buffy grayish, becoming nearly clear dull gray on sides of nose and around eyes; nape varies from light broccoli brown to dusky drab; front half of ears varies from nearly plain dull gray to buffy gray; basal half or two-thirds on back of ears pure white, changing on terminal half or three-fourths of an inch to a well-marked black patch, smaller and more sharply defined than in *xanti;* front of ears bordered with a fringe of gray; tip narrowly edged with black, and posterior border narrowly edged with pure white; top of tail black; underside pale grayish buffy; front of fore legs and tops of fore feet rich pinkish buff, deeper than sides of body, and slightly overlaid with blackish; sides and back of hind legs similar to sides of body but clearer buffy; front of hind legs and tops of hind feet paler than sides of legs; underside of head white; underside of neck and body nearly uniform dull salmon buff; neck sometimes a little darker or browner.

Skull.—Smallest of all the subspecies of *californicus;* in general form most like *martirensis* but much smaller; rostrum narrow at base and slender; frontal area depressed below plane of supraorbitals, but less strongly so than in *martirensis;* jugals proportionately about the same; upper outline of rostrum similarly flattened; bullæ proportionately larger, rounded; interorbital area narrower than in *xanti*, rostrum slenderer, and bullæ larger.

Average measurements (5 adults).—Total length, 535; tail vertebræ, 92.2; hind foot, 115; ear from notch in dried skin, 99.

Remarks.—This is a pale, small-eared insular form limited to two islands lying close to the southern shore of Lower California. The few specimens examined from the adjacent part of the mainland show an approach to the island animal either in color or size of ears, but in total characters they must be classed with *xanti.*

Total number of specimens examined 7, from:

Lower California (Mexico): Magdalena Island, 5; Margarita Island, 2.

LEPUS CALIFORNICUS XANTI Thomas.

Cape St. Lucas Jack Rabbit.

Lepus californicus xanti Thomas, Ann. and Mag. Nat. Hist., ser. 7, I, pp. 45–46, January 1, 1898. Type from Santa Anita, Lower California, Mexico, in British Museum; collected by D. Coolidge, June 3, 1896.

Geographic distribution.—Southern part of Peninsula of Lower California from Loreto on the Gulf coast, Scammon Lagoon on the Pacific, and Comondu in the interior, south to Cape St. Lucas. Vertical range from sea level up to about 4,000 feet in the Cape Region; zonal range mainly Lower Sonoran and upper part of Arid Tropical.

General characters.—Back and sides dark, pinkish buffy brown, approaching the color of *bennetti*, but head and ears grayer than in *martirensis;* underparts cream buff with a vinaceous tinge, varying to an even more strongly salmon buff color than in *martirensis.*

Color in fresh winter pelage.—Top of head dull pinkish buff, sometimes becoming grayish about base of ears; sides of head gray, a little darkened by very short black tips of hairs, and becoming almost white on rings about eyes; top of back dark pinkish buff heavily washed with black; front half of ears gray, shaded with buff and darkening to brownish gray toward tips; posterior half of ears grayish white, shading on terminal part into a not strongly marked blackish patch about an inch wide and darkest about tip where it forms a narrow black border; front border of ear on inside fringed with long grayish or grayish buffy hairs; posterior border of ear narrowly edged with clear white, with an adjacent grayish brown band succeeded on remainder of inner side by light gray; nape dusky sometimes smoky brown overlaid or grizzled with buff; line down base of rump and over top of tail black; the black line on rump less extended than in *californicus;* underside of tail dingy buffy gray, varying to dingy buff; underparts of body dull salmon buff varying to cream buff with a vinaceous tinge; underside of neck varying from buffy fawn color to a salmon buff tinged with brown; front of fore legs and tops of feet buffy cinnamon darkened by overlying short black tips to hairs; back and sides of hind legs and feet dull drab with a vinaceous tinge, shading into paler on tops of feet.

In worn pelage most of the black wash on upper parts is lost, and the buff both above and below becomes much paler, fading to a light creamy buff.

Skull.—Much shorter than in *californicus,* with supraorbitals broader, jugal smaller and deeply grooved; bullæ much larger (actually as well as proportionately) and more rounded (but averaging smaller than in *magdalenæ*); rostrum broad at base and heavily proportioned, with upper outline strongly curved; frontal region full, nearly plane, with broad, wing-like supraorbital processes.

Average measurements (5 adults).—Total length, 523; tail vertebræ, 80; hind foot, 113; ear from notch in dried skin, 116.

Remarks.—Specimens from San José del Cabo, Santa Anita, and La Paz are typical. Those from Cape St. Lucas are paler, approaching the pale form on Magdalena Island in the general color of the body, but the size and color of the ears agree more nearly with *xanti.* Three specimens from Matancita, on the mainland near the northern end of Magdalena Island, have the color a little paler than typical *xanti,* and the ears are small as in *magdalenæ.* A single specimen from the desert plain 20 miles west of San Ignacio has the head and body pale colored like *magdalenæ* with ears colored like *xanti,* except that the black area on the back of the ears is restricted to a narrow border at the tip, in place of the usual well-marked patch. The specimens from Matancita and west of San Ignacio represent various degrees of intergradation between *xanti* and *magdalenæ.*

Total number of specimens examined 27, from:

Lower California (Mexico): Cape St. Lucas, 7; La Paz, 5; Matancita, 4; San Ignacio (20 miles west of), 1; San Jorgé, 1; San José del Cabo, 1; Santa Anita, 7; Santa Clara Mountains, 1.

LEPUS INSULARIS BRYANT.

ESPIRITU SANTO JACK RABBIT.

Lepus insularis Bryant, Proc. Calif. Acad. Sci., ser. 2, III, p. 92, April 23, 1891. Cotypes from Espiritu Santo Island, near La Paz, Gulf of California, Mexico; Nos. $\frac{288}{301}$, ♂ ad., and $\frac{289}{302}$, ♀ ad., California Academy of Sciences collection; collected by W. E. Bryant, November 2, 1890 (both destroyed by fire April, 1906).

Lepus edwardsi **Remy Saint-Loup, Bull. Mus. d'Hist. Nat., Paris, No. 1, pp. 4–6, February, 1895. Type from Espiritu Santo Island, Gulf of California, Mexico; in Paris Museum; collected by Leon Diguet.**

Geographic distribution.—Espiritu Santo Island, Gulf of California. Vertical range from sea level up to about 1,000 feet. Lower Sonoran and upper border of Arid Tropical Zone.

General characters.—The most remarkably colored member of the group; upperparts mainly glossy black, grizzled and suffused on sides of back and body, and sometimes on head, with dark buffy or reddish brown; underparts dark cinnamon buffy or dusky brown; ears and sides of head grayish dusky; size smaller than *californicus* with shorter ears.

Color in fresh winter pelage.—Top of head glossy black, usually with a few white hairs on middle of crown, and often more or less grizzled with dark buffy or grayish brown, especially about base of ears; sides of head blackish grizzled with gray, and eyes surrounded by a ring of nearly clear gray; front half of ears blackish, finely grizzled, especially on basal half, with gray; posterior half of ears gray with black at tip reduced to a narrow black border; inside of ears gray, fringed along front edge with long gray hairs and along posterior border by velvety white; nape and rest of upperparts, including top of tail, glossy black with fine grizzling of dark cinnamon, or brownish; shoulders and sides of body mainly dark buffy or cinnamon buffy, the cinnamon or buffy becoming clearer downward; top of fore legs and feet similar to sides of body, but a little more rusty or reddish; hind legs like sides of body; tops of hind feet paler, sometimes dingy whitish, but tops of toes always dark buffy and between the toes blackish; underside of tail dull buffy-brown; underside of head dark iron gray; rest of underparts varying from dark cinnamon buffy to dusky brown, nearly uniform in some cases, in others the underside of neck darker (like sides of body), and underside of body clearer or lighter buffy, with little or none of the dusky grizzling present in darker-colored specimens.

Skull.—In size equals that of *L. c. martirensis* but braincase broader; supraorbital processes narrower; jugals heavier, with deeper pit anteriorly; bullæ larger. In general appearance the skull of *insularis* most closely resembles that of *L. c. xanti*, but larger with bullæ larger and supraorbitals even more slender than in *magdalenæ;* jugals very heavy, about equaling *L. c. richardsoni* and heavier than in any form of *californicus* found in Lower California.

Average measurements (5 adults).—Total length, 574; tail vertebræ, 95.8; hind foot, 121; ear from notch in dried skin, 105.

Remarks.—This remarkable species is evidently derived from the form of *californicus* inhabiting the adjacent mainland. It is confined to the small island of Espiritu Santo at the mouth of the La Paz Bay. This island is only about 6 by 14 miles in extent, and is mainly mountainous, rising to nearly 2,000 feet at the highest point, with narrow valleys here and there. The rabbits are found mainly in the valleys and on adjoining lower slopes of the hills. The vegetation and geological formation, including the color of the rocks, are the same as those on the adjacent mainland, from which it is separated by a channel less than 4 miles broad and only 8 fathoms deep at the deepest point. The only predatory mammal on the island is *Bassariscus*, which probably never molests even young rabbits. A few sparrow hawks, buzzards, and caracaras were the only birds of prey seen by us. From this it is evident that the natural enemies of these rabbits are few. The species was rather numerous in the valleys, but much less abundant than I have often seen jack rabbits at places on the mainland of the peninsula.

At a short distance *insularis* looks coal black, and is extraordinarily conspicuous the moment it appears on open or rocky ground, even when motionless. These jack rabbits look like short charred stumps among the green or gray-green vegetation, or on bare brown hill-slopes.

Espiritu Santo Island, from its situation, geological character, the contour of the shore on both sides, and the formation of the bottom of the shallow dividing channel, evidently formed a part of the mainland at no very distant date. Under precisely the same conditions of climate, vegetation, and other physical surroundings on the mainland there is no sign of a tendency toward melanism among the abundant jack rabbits (*L. c. xanti*).

Isolation of the jack rabbits on Espiritu Santo Island, combined with the absence of natural enemies in the form of predatory birds and mammals, has removed the ordinary necessity for protective coloration. As a result the tendency toward variation away from the type has had free play and resulted in the remarkable color development of *Lepus insularis*. I am unable to suggest any reason except that of isolation, why this species should have developed coloration so different from that of any of its relatives.

The range of individual variation in this species is not great, and consists mainly of the varying amount of cinnamon grizzling on the black upper parts and of dusky grizzling in the buffy of the lower parts.

Total number of specimens examined 19, from:

Lower California (Mexico): Espiritu Santo Island, 19.

Genus SYLVILAGUS Gray.

SYLVILAGUS FLORIDANUS Group (Subgenus SYLVILAGUS).

EASTERN COTTONTAILS.

The best known and most widely distributed rabbits of North America are the cottontails which live mainly east of the Rocky Mountains in the United States and east of the Sierra Madre in Mexico. The first of these to become known to naturalists was the common cottontail of the eastern United States, named *Lepus sylvaticus* by Bachman in 1837. Unfortunately, after long use, this name proved to be preoccupied, and was replaced in 1898 by *mallurus* of Thomas. By this change *floridanus*, published in 1890, became the oldest name available for the species and to typify a series of species so closely related that they may be called the *floridanus* group. Large collections of specimens from the United States and southward show conclusively that a single species, *Sylvilagus floridanus*, covers an enormous range extending over most of the eastern United States from the Atlantic coast to the Rocky Mountains and from southern Ontario to the Rio Grande. Beyond this to the south it ranges from the Gulf coast to the Sierra Madre of Mexico and from the northern border of Mexico south, through Yucatan and the highlands of Guatemala, to Nicaragua and Costa Rica (see fig. 11). The range of the *floridanus* group extends entirely across the continent only at the Isthmus of Tehuantepec and thence southeasterly nearly to the border of Guatemala. Under the varied conditions of the vast area occupied by it, *S. floridanus* has developed numerous geographic subspecies, as follows: *mallurus*, *mearnsi*, *similis*, *alacer*, *chapmani*, *holzneri*, *subcinctus*, *restrictus*, *orizabæ*, *connectens*, *russatus*, *aztecus*, *chiapensis*, and *yucatanicus*. In addition to these, the closely related *S. transitionalis*, *S. robustus*, and *S. cognatus* make up the *floridanus* group.

On the east coast the range of the species of this group is continuous from southern Maine and New Hampshire, to Yucatan; on the Pacific side, only from Tehuantepec to Guatemala. They occupy the highlands on both sides of the Isthmus of Tehuantepec and most of the elevated interior of Chiapas and, so far as we know, reach their southern limit in northern Costa Rica. Northwest of Tehuantepec their range is not known to touch any point on the shore of the Pacific, either in Mexico or the United States, though on the mountains about the southwestern border of the Mexican Tableland, near the city of Tepic, Territory of Tepic, and on the Sierra Nevada de Colima, Jalisco, they approach within 30 or 40 miles of this coast. The comparatively narrow belt of coast lowlands and adjacent mountain slopes which separate the range of local representatives of *florida-*

nus from the Pacific coast between Tehuantepec and central Sinaloa is occupied by forms of a very distinct species, *S. cunicularius;* from central Sinaloa north to San Francisco Bay they are replaced by subspecies of *S. auduboni.*

The ranges of members of the *floridanus* group are usually limited to areas in which climatic conditions favor abundant growths of trees or dense thickets which afford congenial shelter. Partly wooded districts traversed by small streams, such as are common in the Mississippi Valley, are favorite situations. Similar areas in eastern Mexico and the pine-forested slopes of the mountains about the

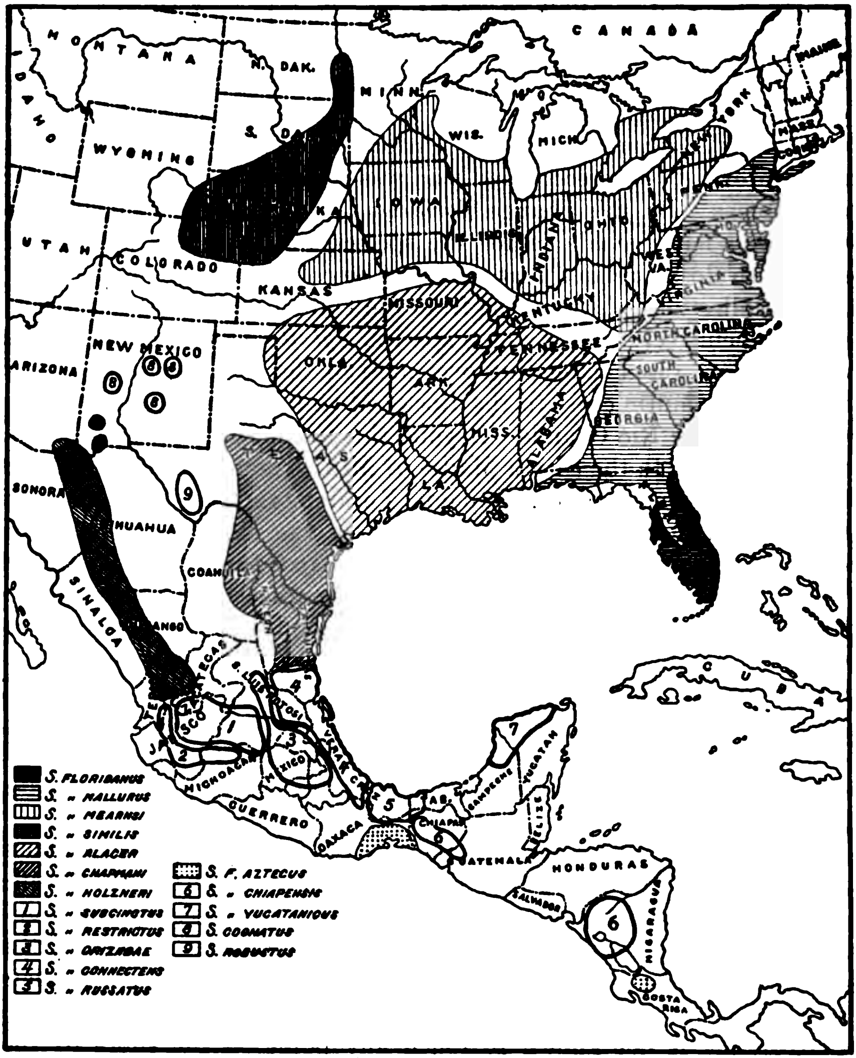

FIG. 11.—Distribution of the eastern cottontails, *Sylvilagus floridanus* group.

Mexican Tableland also are favored areas. The subspecies of the Mississippi Valley follow the long tongue-like extensions of timber and brush which reach westward from the generally forested sections along the river courses into the otherwise treeless plains east of the Rocky Mountains. One form, *similis*, follows the Platte River and its tributaries through western Kansas and Nebraska to southeastern Wyoming, and across Colorado to the base of the Rocky Mountains near Denver. *S. f. holzneri*, *robustus*, and *cognatus* live on the timbered upper slopes of isolated mountain groups, such as the Huachucas of Arizona, the Davis Mountains of west Texas, and the Manzano Mountains of New Mexico, while the surrounding treeless plains are occupied by forms of *auduboni*.

From the fondness of its members for forested areas the *floridanus* group may be termed wood rabbits as distinguished from the *auduboni* group of the West, which is characteristic of open arid plains. *S. transitionalis* is the most strictly forest-frequenting species of the *floridanus* group. The ranges of subspecies of *floridanus* and *auduboni* overlap over considerable areas, especially in Texas and on parts of the Mexican Tableland. On some of the western prairies a subspecies of *floridanus* lives along the narrow belt of timber or brush bordering streams, while a subspecies of *auduboni* occupies the adjacent open prairie. Owing to their arid treeless character, no representative of the *floridanus* group inhabits the plains, which extend in a broad belt along the east base of the Rocky Mountains and the Sierra Madre from southern Colorado and southwestern Kansas south to Zacatecas on the tableland of Mexico.

The forms of *floridanus* occupy several life zones from the Tropical to the Boreal. Two subspecies in Mexico, *S. f. connectens* and *S. f. orizabæ*, have a combined range of over 14,000 feet in altitude. *Connectens* ranges from sea level in Vera Cruz up on the basal slope of Mount Orizaba, and *orizabæ* ranges thence to above timberline at the altitude named.

The members of this group may be separated roughly into two subordinate groups characterized by color—a gray series and a rusty or brownish one. The members of the gray series occupy the more arid parts of the territory of the group, where there is least vegetation. They are characterized by paler color and by a rather straighter and more tapering rostrum. This series includes the species *S. robustus* and *S. cognatus*, with the following subspecies of *floridanus: similis*, *chapmani*, *holzneri*, *orizabæ*, and *subcinctus*.

The members of the brownish series live in more humid areas where vegetation is more abundant and, in addition to browner colors, have the rostrum proportionately heavier and more decurved near the tip. This series includes *S. transitionalis* and typical

S. floridanus with its subspecies *mallurus*, *mearnsi*, *alacer*, *restrictus*, *connectens*, *russatus*, *aztecus*, *chiapensis*, and *yucatanicus*.

The gray series occupies the plains and desert mountains of the United States from Colorado to the southern end of the Mexican Tableland, including the arid coast strip of southern Texas and adjacent part of Tamaulipas. The brown series is from the wooded parts of the eastern United States, the coast region of eastern Mexico, and the heavily wooded mountains of southern Mexico. The contrast between the small gray *chapmani* and the large rusty *yucatanicus* is remarkable, but complete intergradation exists through *connectens*, *russatus*, *aztecus*, and *chiapensis*.

There is considerable variation in the shade of buff or ochraceous buff on the upperparts in the fresh pelage of all the forms, and in addition a progressive fading due in each case to the wearing of the overlying long glossy black hairs and the bleaching of the buffy body color. Worn spring and summer specimens often have a much more rusty color than those in fresh pelage. Considerable individual variations in size and proportions of both body and skull occur, thus rendering the satisfactory description of closely related forms extremely difficult. The differences of color depend mainly upon variations in intensity of the buffy ground color, and, to a certain extent, upon the abundance of the overlying long black hairs.

Much yet remains to be done in working out details of the exact distribution of the various subspecies of *S. floridanus*. The Mexican material shows that *chapmani* ranges south through eastern Mexico and merges into *connectens* in the lowlands of Tamaulipas and into *orizabæ* on the eastern part of the tableland of Nuevo Leon and San Luis Potosi. *Orizabæ* merges into *subcinctus* in the south-central part of the tableland, and *subcinctus* into *holzneri* in Jalisco and southwestern Zacatecas. *Holzneri* extends thence north along the Sierra Madre into the mountains of southern Arizona.

S. robustus and *S. cognatus* are large pale species, often indistinguishable in color, but readily separable by size, proportions, and skull characters. Both also resemble *holzneri* in color. The skulls of *holzneri* and *cognatus* show considerable similarity in general appearance. The skulls of *holzneri* are so much like those of *S. nuttalli pinetis* that a serious question arises of their specific distinction, to determine which much additional material from the mountains of Arizona and central New Mexico is needed. The subspecies of *floridanus* living in the tropical coast country of Mexico have shorter, thinner, and coarser hair than those of higher or cooler areas of the United States and Mexico. The two southernmost subspecies, *yucatanicus* and *chiapensis*, are the largest members of the group and have extremely massive skulls with the postorbital processes, especially in *yucatanicus*, welded to the skull almost exactly as in the swamp rabbits of the United States. The resemblance between the skulls of these two forms and those of the swamp rabbits (*S. aquaticus*) in general shape and massiveness of proportions is remarkable. This gives a good example of parallel development in two very distinct species from widely separated regions. The skull resemblance coupled with the rather coarse pelage caused the first specimens of *yucatanicus* to be identified as *aquaticus*, and thus made an erroneous record for the latter species far beyond its actual range.

Average measurements of species and subspecies of the Sylvilagus floridanus group.

	No. of specimens averaged.	Skin.				Skull.							Origin of specimens averaged.
		Total length.	Tail vertebræ.	Hind foot.	Ear from notch, in dried skin.	Basilar length.	Length of nasals.	Breadth of rostrum above premolars.	Depth of rostrum in front of premolars.	Interorbital breadth.	Parietal breadth.	Diameter of bullæ.	
Sylvilagus floridanus..	5	436	45.0	90.0	55.6	54.8	30.6	18.4	16.5	18.1	26.1	11.8	Micco and Kissimmee, Florida.
Sylvilagus floridanus mallurus.	5	446	65.0	93.8	58.6	57.6	32.4	20.7	15.7	19.1	27.9	11.0	Raleigh, North Carolina.
Sylvilagus floridanus mearnsi.	5	446	60.0	104.0	54.8	55.9	32.9	20.5	14.9	18.4	28.2	10.8	Central Minnesota, and Delavan, Wisconsin.
Sylvilagus floridanus similis.	5	408	52.0	99.0	50.0	53.1	31.1	19.6	14.4	16.0	26.6	10.0	Northwestern Nebraska.
Sylvilagus floridanus alacer.	5	418	56.0	92.0	52.0	53.9	31.5	19.5	14.6	17.7	26.3	10.1	Stillwell, Oklahoma, and Stone County, Missouri.
Sylvilagus floridanus chapmani.	5	403	50.4	92.0	49.0	50.1	30.1	18.4	16.8	17.1	26.0	10.2	Corpus Christi and Comstock, Texas.
Sylvilagus floridanus holzneri.	5	425	71.0	98.0	62.0	53.5	31.5	18.9	14.1	17.4	26.3	11.8	Huachuca and Chiricahua Mountains, Arizona.
Sylvilagus floridanus subcinctus.	5	400	51.0	91.0	57.0	53.6	31.5	17.8	14.7	18.2	26.8	10.8	Near Lake Chapala, Jalisco, Mexico.
Sylvilagus floridanus restrictus.	5	422	54.0	93.0	59.5	54.3	31.5	18.8	15.1	17.7	26.4	10.6	Near Zapotlan, Jalisco, Mexico.
Sylvilagus floridanus orizabæ.	5	375	39.0	87.0	59.0	52.0	29.7	16.7	13.8	17.4	26.4	10.5	About Mount Orizaba, Mexico.
Sylvilagus floridanus connectens.	5	434	58.0	94.0	60.0	56.5	34.4	19.6	15.8	18.2	26.4	10.9	Central Vera Cruz, Mexico.
Sylvilagus floridanus russatus.	5	416	45.0	89.0	51.0	53.9	32.7	19.4	15.2	16.7	25.1	11.2	Southern Vera Cruz, Mexico.
Sylvilagus floridanus aztecus.	5	444	54.0	97.0	58.0	56.7	33.4	18.3	15.4	18.9	25.5	9.9	Near Tehuantepec City, Mexico.
Sylvilagus floridanus chiapensis.	5	463	52.0	97.0	60.0	58.9	35.2	21.1	15.5	17.6	25.9	9.9	Central Chiapas, Mexico.
Sylvilagus floridanus yucatanicus.	5	461	60.0	97.0	61.0	59.2	35.2	20.2	16.8	19.1	27.0	11.3	Yucatan and Campeche, Mexico.
Sylvilagus cognatus [a] .	5	451	65.0	102.0	67.0	54.7	32.4	18.8	14.4	18.7	26.9	10.7	Manzano and Capitan Mountains, New Mexico.
Sylvilagus robustus....	5	456	61.8	108.0	68.8	57.6	33.7	19.9	15.1	19.4	27.1	12.1	Chisos and Davis Mountains, Texas.
Sylvilagus transitionalis.	5	388	39.0	95.0	51.6	54.8	28.1	19.9	14.4	17.1	26.6	9.6	Wilmington, Massachusetts.

[a] The measurements of the body in this species are the averages of only two specimens. The measurements of the ear and skull are the averages of five, as in all the others.

SYLVILAGUS FLORIDANUS (ALLEN).

FLORIDA COTTONTAIL.

(Pl. IX, figs. 2, 5.)

Lepus sylvaticus floridanus Allen, Bull. Am. Mus. Nat. Hist., N. Y., III, p. 160 (author's separates issued October, 1890). Type from near Micco, San Sebastian River, Brevard County, Florida; No. $\frac{1829}{1165}$, ♀ ad., American Museum of Natural History; collected by F. M. Chapman, March 18, 1889.

Geographic distribution.—All of peninsular Florida (including coastal islands) south of Sebastian River and thence northward along the coast to St. Augustine on the east side, and to an unknown distance on the west side. Vertical range from sea level up to about 100 feet altitude; zonal range mainly Lower Austral.

General characters.—Small and dark; varying from dark-grayish buffy to rusty, buffy brown; nape and legs rich cinnamon rufous; ears short, rounded, and darker than back; bullæ proportionately large.

Color in fresh winter pelage.—Top of head and back dark buffy brown, usually tinged with reddish, and sometimes dull dark rusty buffy; sometimes dull dark buffy brown with a slightly grayish shade; rump and sides of body dark buffy gray and like back much darkened by a strong wash of black; nape rich dark rusty rufous; top of tail dull rusty brown; front of fore legs deep dark cinnamon rufous or dark rusty rufous, a little paler than nape and shading into a paler, more buffy color on tops of fore feet; back and outside of lower part of hind legs varying from dull rusty cinnamon brown to intense dark cinnamon or rusty rufous; sides of hind feet similar to adjoining part of hind legs, but paler; tops of hind feet vary from dull buffy whitish to dull rusty buffy; underside of neck dull dark ochraceous buffy varying in intensity but always deeply colored; lower border of flanks usually bordered by a narrow band of clearer buff than rest of sides; outside of ears dark grayish buffy heavily bordered and washed with black, especially on terminal half.

Worn pelage.—In faded condition this form loses most of the reddish on upperparts and becomes paler and grayer.

Juvenal pelage.—Very dark, slightly yellowish buffy brown; front and hind feet dingy buffy; sides of head and body slightly grayer than back; rump patch not appreciable; nape dark, dingy rusty; top of tail rusty brown.

Skull.—Short; heavily proportioned; upper outline strongly curved over top and back of braincase; flattened over frontal area, including base of rostrum, and with a well-marked curve over anterior two-thirds of rostrum, most marked near tip; base of rostrum broad and heavy; supraorbital processes broad, heavy, nearly on a plane with frontal area; the anterior notch small or obsolescent, giving a broad frontal area and adding to the heavy appearance of skull; postorbital process of supraorbital broad, nearly the same width throughout its length, often inclosing a well-marked flattened oval foramen, but frequently extended on inner border to coalesce with skull and much reduce this foramen or sometimes to completely close it; sides of rostrum usually swollen or expanded; zygomatic arch heavy; jugal massive, deeply grooved anteriorly; molar series proportionately broad and heavy; palatal bridge broad; bullæ proportionately large, slightly expanded on inner side and with the smooth almost polished surface characteristic of the group; basioccipital usually not much constricted posteriorly.

Average measurements (*5 adults*).—Total length, 436; tail vertebræ, 45; hind foot, 90; ear from notch in dried skin, 55.6.

Remarks.—The Florida cottontail is one of the smallest and darkest of the group, and in the dark rusty color of nape and legs and ordinarily dark slightly buffy brown shade of upperparts, resembles some of the deeply colored tropical subspecies found in Mexico. There is a wide individual range in color from rich dark rufous of legs and nape and rusty reddish back to dark slightly grayish buffy back and dull rusty cinnamon on the hind legs.

The pelage of *floridanus* is often freshly molted in July, as shown by specimens from the type locality (Micco) the 10th of that month. Another specimen from the same locality, taken January 22, is in the pale bleached or grayish condition common to worn specimens, ordinarily taken later in the season. Many midwinter specimens are still in the dark slightly worn fur, but January, February, and March skins are commonly distinctly paler or grayer and less reddish than the fresher ones taken between July and December. By April they are much bleached and have commonly lost most or all of the rusty suffusion of the freshly molted pelage and are pale dull grayish buffy brown.

Typical *floridanus*, characterized by its small size, short ears, and proportionately large bullæ, is peculiar to the coast lowlands. In the interior region of the State, above the 100-foot contour line, as far south as northern Polk County (Lake Julian), it is replaced by *mallurus*. In southern Polk County the rabbits are intermediates, while in De Soto County they appear to be true *floridanus*. The distribution of true *floridanus* thus appears to lie wholly below the 100-foot contour line in the peninsular part of the State. Its northern and western limit on the west coast is unknown.

Total number of specimens examined 58, from:

Florida: Blitches Ferry (near Citronelle), 1; Citronelle, 7; Enterprise, 3; Fort Kissimmee, 13; 35 miles south of Fort Kissimmee, 1; Kissimmee River (De Soto County), 4; Lake Harney, 6; Lake Worth, 1; Miami, 1; Micco, 6; opposite Micco (on eastern peninsula), 1; Mullet Lake, 2; San Mateo, 3; Saw Grass Island, 2; Sebastian, 2; Shell Hummock, 4; Southport Canal, 1.

SYLVILAGUS FLORIDANUS MALLURUS (THOMAS).

EASTERN COTTONTAIL.

Lepus sylvaticus Bachman, Journ. Acad. Nat. Sci. Phila., VII, p. 403, 1837. No type nor type locality. Name given to the "common gray rabbit" of the eastern United States, but probably with particular reference to this form in South Carolina. [Name preoccupied by *Lepus borealis sylvaticus* Nilsson, 1832, from Sweden. See Thomas, Ann. and Mag. Nat. Hist., ser. 7, II, p. 320.]

Lepus nuttalli mallurus, Thomas, Ann. and Mag. Nat. Hist., ser. 7, II, p. 320, October 1, 1898. Type from Raleigh, North Carolina; No. 97.2.1.30, ♀ ad., British Museum; collected by H. H. and C. S. Brimley. [Name proposed to replace *L. sylvaticus* Bach. preoccupied.]

Geographic distribution.—Mainly east of Allegheny Mountains from Long Island and the lower Hudson Valley in extreme southeastern New York south through New Jersey, Delaware, eastern Pennsylvania, eastern West Virginia, Maryland, Virginia, North and South Carolina, Georgia, except northwestern part, and west along Gulf coast to near Mobile Bay, and Alabama; also northwestern central parts of Florida south to about Lake Julian, Polk County. Vertical range from near sea level in North Carolina up to about 6,000 feet on Roan Mountain; zonal range from Lower Austral up through Transition Zone, mainly Upper Austral.

General characters.—Larger, with longer ears than *floridanus;* less heavily washed with black on upperparts and generally of a paler rusty buffy color; gray rump patch more distinct and legs paler, less deeply ferruginous; distinctly more reddish on upperparts and deeper rufous on legs than in *mearnsi;* skull much larger than in *floridanus*, proportionately narrower, with bullæ smaller and jugal slenderer.

Color in fresh autumnal pelage.—Top of head and back dull rather dark rusty yellowish or slightly rusty ochraceous buffy, paler and less heavily washed with black than in *floridanus;* sides of head and body dark slightly buffy gray, usually distinctly paler and grayer than top of back with a thinner wash of black; rump less tinged with dull buff than sides of body and nearly plain dull iron gray, forming a fairly distinct rump patch; nape rich rusty rufous, lighter than in *floridanus;* top of tail dull rusty brown; outside of ears dull grayish buffy, bordered anteriorly and about tip with blackish; front and outside of fore legs dark rusty rufous, paler than in *floridanus* and shading into rusty buff on tops of fore feet; outside and back of lower hind legs varying from nearly cinnamon buffy to rather light rusty cinnamon, same color extending along sides of hind feet; tops of latter whitish or pale rusty buffy; underside of neck usually rich dark ochraceous buffy varying to dark dull buffy.

Skull.—Longer and proportionately narrower top of braincase higher arched, and rostrum proportionately slenderer and more strongly decurved near tip than in *floridanus;* supraorbitals similarly broad and heavy with a more strongly marked notch anteriorly, and inner side of broad postorbital process nearly or quite touching skull along most of its length, as in *floridanus;* zygomatic arch lighter; bullæ averaging smaller; molar series heavy, about the same as in *floridanus.* Skull almost indistinguishable from that of *mearnsi* both in size and proportions, but averaging a little heavier.

Average measurements (5 adults).—Total length, 446; tail vertebræ, 65; hind foot, 93.8; ear from notch in dried skin, 58.6.

Remarks.—This form is larger and paler than *floridanus,* and appears to reach its extreme development about the Dismal Swamp of Virginia. A specimen from Lake Julian, central Florida, is typical in size with even larger skull and longer ears than usual, and thus is in strong contrast to the small, short-eared *floridanus* found near by in the coast lowlands. Specimens from several localities in Polk County, Florida, not far south of Lake Julian, are intermediate between *floridanus* and *mallurus,* but a specimen from a little farther south (De Soto County) is typical *floridanus.* From northern Florida and Georgia the specimens examined are typical. A specimen from Bon Secour, Alabama, just east of Mobile Bay, is an intermediate between the present form and *alacer.*

There is considerable individual variation in color, and two of the darkest and most richly colored specimens examined were taken at Alexandria, Virginia, and Tuckerton, New Jersey. They are a deep rusty buffy brown, much darkened by a heavy overlying wash of black. Others vary to a paler, more pinkish, buffy with a lighter wash of black and with more grayish on sides of rump. Two pale individuals of this kind are in the Survey collection from the type locality (Raleigh), and are not distinguishable from typical specimens of *mearnsi* except by the deeper rufous on the legs and their longer ears. The general tint of the upperparts of *mallurus* is a varying shade of dull rusty, ochraceous buffy, rather lightly overlaid or washed with black, thus giving a warm, slightly reddish buffy brown general effect. The rusty cinnamon on hind legs is usually dull, but sometimes becomes more or less strongly rusty or almost chestnut rufous.

Six specimens from Roan Mountain are typical in color, but have distinctly shorter ears than specimens from elsewhere in the range of *mallurus,* and the skull is proportionately a little shorter, the base of the rostrum broader, the jugals slenderer, and bullæ smaller. The short ears of this series is a good character, and shows that a slightly marked local form exists on this mountain, though scarcely well enough characterized to be worthy of subspecific recognition.

The typical juvenal pelage is dark, dull buffy grayish brown, but specimens from about the District of Columbia and southern New Jersey agree with the adults from those localities in having darker and richer colors than specimens from most other parts of its range.

Although specimens from the Dismal Swamp, Virginia, show the extreme development of the characters of *mallurus* in size of skull and bullæ, yet there is a distinct grading off into smaller skulls and bullæ about Washington and thence north.

A specimen from Grantsville, in extreme western Maryland, is a distinct intergrade nearly pale enough to be classed with *mearnsi*. Several examples in the Philadelphia Academy of Sciences, from Haddonfield, New Jersey, are distinctly smaller than typical specimens with much smaller and lighter skulls. The small light skulls with the small rounded bullæ closely resemble those of *transitionalis*, but the form of the supraorbital with its squared anterior process and distinct notch and, in most instances, the color of the pelage place these specimens with *mallurus*. The undoubted similarity in size, and often in color, between specimens of *mallurus* and *transitionalis* from New Jersey and southeastern New York (including Long Island) at first glance appears to indicate intergradation. Closer examination, however, shows that these small specimens of *mallurus* are always distinguishable by the presence of a broad anteorbital process of the supraorbital with a well-defined notch.

That we have here another case of parallel development, or possibly hybridization, and not intergradation, is shown by the fact that *transitionalis* remains perfectly typical as far south in the range of *mallurus* as Washington, District of Columbia, and to West Virginia, Roan Mountain, North Carolina, and northern Georgia. The people of southwestern Georgia call this species the sage rabbit.

Total number of specimens examined 152, from:

Alabama: Bon Secour, 1.
Florida: Chattahoochee, 1; Gainesville, 2; Lake Julian, 1; Whitfield, 1.
Georgia: Abbeville, 4; Americus, 1; Augusta, 3; De Soto, 1; Lumpkin, 2; Nashville, 1; Riceboro, 3; Thomasville, 2.
North Carolina: Hatteras, 1; Raleigh, 15; Roan Mountain, 6; Waynesville, 1.
South Carolina: Aiken, 1; Frogmore, 4; Georgetown, 1; Society Hill, 1.
Virginia: Alexandria, 1; Arlington, 6; Belle Haven, 2; Campbell County, 3; Cape Charles, 2; Dismal Swamp, 5; Dunn Loring, 1; Fishermans Island, 1; Fort Myer, 1; Great Falls, 1; Hampstead, 2; Kinsale, 1; Mount Vernon, 1; Peaks of Otter, 2; Smiths Island, 3.
West Virginia: Earnshaw, 8; Franklin, 2; Ronceverte, 3; Wetzel County, 1.
Maryland: Grantsville, 1; Kensington, 1; Lanham, 1; Marshall Hall, 1; Plummer Island, 1; Rock Point, 1.
District of Columbia: Washington, 7.

Pennsylvania: Carlisle, 2; Chester County, 1; Cooks Mills (Bedford County), 2; Holmesburg, 2; Laughlintown, 2; Marple, 1; Potts Grove, 1; Stroudsburg, 2; Summit Mills, 2; Tyrone, 1; Waynesburg, 1.
New Jersey: Haddonfield, 5; Tuckerton, 3.
New York: Hastings, 6; Lake Grove, 1; Millers Place (Long Island), 8; Nyack, 3; Palenville, 1; Sing Sing, 1.

SYLVILAGUS FLORIDANUS MEARNSI (ALLEN).

MEARNS COTTONTAIL.

Lepus sylvaticus mearnsi **Allen, Bull. Am. Mus. Nat. Hist., N. Y., VI, p. 171 (footnote), 1894 (author's separates published May 31, 1894). Type from Fort Snelling, Minnesota; No. $\frac{4468}{3398}$, ♂ ad., American Museum of Natural History; collected by Dr. E. A. Mearns, March 29, 1891.**

Geographic distribution.—West of Allegheny Mountains from Lake Simcoe, Toronto, Canada, central New York, central Pennsylvania, western West Virginia, and eastern Kentucky, and eastern Tennessee, west through southern Michigan and Wisconsin to southeastern Minnesota, and south through Iowa to Trego County, Kansas, northern Missouri and Illinois, with all of Indiana and Ohio. Vertical range from about 500 feet in western New York to about 2,000 feet altitude in mountains of western Pennsylvania; zonal range mainly Upper Austral, extending into lower part of Transition zone.

General characters.—Large, equaling *mallurus* in size, but with shorter ears, longer hind feet and a paler more grayish shade to the light pinkish buffy of the upperparts, and paler rufous on legs; skull very similar but with rather smaller bullæ.

Color of fresh pelage.—Top of head and back pale pinkish buffy, sometimes with a slight ochraceous tinge, and always darkened by the overlying and usually strong wash of black; sides of head and body grayer than back and usually much paler, though with a thin wash of black on tips of hairs; rump dull iron gray, forming a distinct though not strongly contrasted rump patch, more strongly marked than in *mallurus* but washed and darkened with black; upperside of tail dull brownish, more or less strongly grizzled with buffy or buffy gray; nape rather dark rusty rufous; front and sides of fore legs rusty rufous rather paler than in *mallurus* and shading into pale ochraceous buff on tops of fore feet; back and outside of lower hind legs underlaid with rusty chestnut and washed with pale buffy cinnamon or rusty cinnamon; tops of hind feet white, sometimes pale buffy whitish; underside of neck varying from dull pinkish buff to dull ochraceous buff or to pale creamy buff becoming dull yellowish gray on pale individuals; underside of body white, this pale area more restricted than usual; outside of ears buffy grayish, distinctly grayer than top of head, and strongly bordered with black along anterior margin and about tip; inside of ears dull gray, sometimes becoming more or less buffy along posterior border.

Skull.—Scarcely distinguishable from that of *mallurus* but slightly smaller, with bullæ usually smaller.

Average measurements (5 adults).—Total length, 446; tail vertebræ, 60; hind foot, 104; ear from notch in dried skin, 54.3.

Remarks.—The present form is a poorly marked subspecies distinguishable from *mallurus* only by its shorter ears and paler, more grayish, color. There is considerable individual variation. One example from Elk River, Minnesota, not far from the type locality, is so deeply colored that it can be distinguished from ordinary *mallurus* only by its grayer tone, but others from the same locality are typical. One from Burlington, Iowa, is darker than usual, and a series from Onaga in northeastern Kansas is characterized by its dark colors due to the heavier wash of black, and agree in this with others from Wisconsin and the type locality in Minnesota, though the Onaga specimens are smaller, with smaller ears and bullæ, thus showing an approach to *similis*. One from Beaver Dam, Wisconsin, is pale pinkish buffy, closely like *similis* from Nebraska and southwestern Minnesota. In worn pelage these rabbits become pale dingy buffy gray with a slight pinkish tinge. Unusally large and massive skulls occur here and there throughout the range; these skulls are more angular and heavier about the base of the rostrum and heavier in all their proportions, and sometimes differ strikingly from typical or average specimens. The most notable of these seen are one from the type locality, one from Sangamon, Illinois, and one from Elk River, Minnesota. In the eastern part of the range (in Canada, New York, and Pennsylvania) the ears are longer than in the West. Two specimens from southern Canada are scarcely distinguishable from *mallurus* in color, and so differ from the paler specimens from western New York, which are practically like others from Illinois, and average even paler than those from near the type locality. Along the eastern border of its range the ears average longer than in typical specimens and thus are intermediate with those of *mallurus*.

As in the case of *mallurus* the posterior process of the supraorbital is broad and heavy, and commonly rests against the skull at its posterior end, inclosing a narrow and often much reduced foramen. Not uncommonly in old individuals the inner border of the posterior process shuts against the skull along its entire length. Sometimes, as in the case of the skull from Sangamon County, Illinois, this process coalesces along its entire length with the skull, producing a solid bony shield over the eyes as in the swamp rabbits. Another large old skull from St. Louis, Missouri, is unlike any other seen in having the postorbital process broad at the base and tapering rapidly to a sharp point which stands out free from the skull, as in *nuttalli* and some of its forms.

New Hartford, New York, appears to be about the extreme eastern limit of *mearnsi.* Specimens from Ithaca show considerable variation in color from that of typical *mearnsi* to a darker, more reddish, shade closely approaching *mallurus.* Two skulls from Ithaca are very broad across the frontal area, including the base of the rostrum, and the bullæ are unusually large. These variations, sometimes toward typical *mearnsi* and then toward *mallurus*, are such as are usually found in specimens from the border between the ranges of two forms. Much the larger part of a good series of specimens from Toronto and other parts of Ontario are distinctly *mearnsi.* A few out of this series are as reddish as *mallurus*, but their skulls are referable to *mearnsi.* Specimens from Geneseo, New York, and Lopez, Sullivan County, Pennsylvania, are typical *mearnsi;* those from New Hartford and Peterboro, New York, show an approach to *mallurus.* Several individuals from northern Indiana are unusually small and dark, and appear to indicate the existence there of a small local variation. They differ more from typical *mearnsi* than do specimens from western New York.

Mr. J. H. Fleming, of Toronto, has furnished some interesting notes concerning the presence of these cottontails in Ontario, Canada. According to Fleming, cottontails were not indigenous in any part of Ontario. While no definite date can be given for the first appearance of cottontails there, they have been known in Essex for at least forty years. They were first noted at Niagara about 1871. During the last twenty years [previous to 1908] they have steadily increased. Their northern limit in January, 1908, is placed by Mr. Fleming at about a line drawn from Kincardine, on the eastern shore of Lake Huron, east through Lake Simcoe to Trenton on the north side of Lake Ontario, but their center of abundance is given as still remaining south of Sarnia.

An August specimen from Peterboro, New York, has a suffusion of dull rusty buffy over most of upperparts, giving a distinctly reddish cast, as strongly marked as in most examples of *alacer.* In a letter dated December 30, 1904, and published by Bangs,[a] Gerrit S. Miller, jr., states that a reliable local hunter first saw cottontails at Geneva, New York, in 1870 or 1871. Miller gives the date of the first arrival of cottontails at Peterboro as twenty years previous to 1904, and thinks they came to that vicinity from the west. So far as our present information goes there appears to be a wide break between the eastern border of *mearnsi* in central New York and the northern border of the range of *mallurus* in the southeastern part of the State.

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[a] Proc. Bost. Soc. Nat. Hist. for 1894, XXVI, p. 410, 1895.

This cottontail for the first time reached Gordon, Wisconsin, in the northern part of the State during the fall of 1907. It was reported to have been common for some time just south of Gordon, but was formerly unknown throughout this region.

Judging from their known habits and recent extension of range it is very probable that, with the exception of *S. transitionalis*, no form of cottontail was indigenous to any part of New England, to New York, New Jersey, Delaware, nearly, if not quite, all of Pennsylvania, and perhaps a considerably greater area in the eastern United States.

Total number of specimens examined, 162, from:

Ontario (Canada): London, 1; Lorne Park, 8; North Toronto, 4; Point Pelee, 3; Rodney, 1; Sarnia, 4; Streetsville, 3; Thamesville, 1.
New York: Geneseo, 3; Ithaca, 8; New Hartford, 1; Peterboro, 2.
Pennsylvania: Allegheny County, 1; Beaver, 1; Erie, 2; Hartstown, 1; Lopez, 3; Meadville, 2.
Ohio: Garrettsville, 4.
Indiana: Culver, 1; Hebron, 1; Mitchell, 4.
Michigan: Ann Arbor, 10; Hamlin Township (Eaton County), 1; Portage Lake, 3.
Illinois: Sangamon, 1; Waukegan, 1; Woodstock, 3.
Wisconsin: Beaver Dam, 2; Camp Douglas, 3; Delavan, 6.
Minnesota: Elk River, 3; Fort Snelling, 16.
Kentucky: Lexington, 1.
Tennessee: Highcliff, 1; Holston Mountains, 1; Watauga Valley, 2.
Iowa: Burlington, 2; Fort Des Moines, 1; Iowa City, 3; Ruthven, 8; Sioux City, 1; Van Buren County, 1.
Nebraska: Brownlee, 1; Kennedy, 2.
Kansas: Leavenworth, 4; Lawrence, 7; Manhattan, 1; Onaga, 10; Trego County, 3; Wakeeney, 4; Washington County, 1.

SYLVILAGUS FLORIDANUS SIMILIS Nelson.

Nebraska Cottontail.

Sylvilagus floridanus similis Nelson, Proc. Biol. Soc. Washington, XX, p. 82, July 22, 1907. Type from Valentine, Nebraska, No. 69517, ♂ ad., U. S. National Museum (Biological Survey collection); collected by C. P. Streator, November 10, 1894.

Geographic distribution.—Dry plains (mainly along wooded streams) of extreme western Minnesota, eastern North and South Dakota, all of Nebraska (except possibly the Missouri bottom lands), northern Kansas, northeastern Colorado, along tributaries of Platte River to base of mountains near Denver, and southeastern Wyoming. Vertical range, from about 1,500 feet in northeast Nebraska to over 5,000 feet west of Denver, Colorado; zonal range, mainly Upper Sonoran.

General characters.—A pale, slightly buffy, gray form nearest *mearnsi* in general appearance but smaller; ears shorter and distinctly paler; legs paler and more cinnamon than *mearnsi;* underside of neck paler and more grayish buffy; skull smaller, shorter, and usually proportionately heavier.

Color in fresh pelage.—Top of head and back pale pinkish buffy with a grayish cast, especially over shoulders, and a strong grizzling wash of black over rest of back; rump dull iron gray, forming a fairly distinct rump patch; sides of head and body distinctly grayer and less washed with black than back; top of tail dusky gray; nape rather pale rusty rufous; outside of ears gray finely grizzled with dusky and strongly bordered with black around front border and tip; inside of ears grayish white; front and outside of fore legs rather light rusty rufous, sometimes paler and sometimes darker than nape; back and outside of lower hind legs dull cinnamon, varying to buffy cinnamon, and changing into paler shades of same along outside of hind feet; tops of hind feet white; underside of neck varies from dull pale buffy gray to pale creamy or pinkish buffy; rest of underparts pure white, bordered along lower edge of flanks with an indistinct band of pale creamy buff.

Worn pelage.—In spring and summer the pelage on upperparts of body bleaches to a whitish gray slightly shaded with buffy and darkened by a thin grizzling of black; the ears become pale gray narrowly edged with black; the gray rump patch less distinct and underside of neck pale buffy, or yellowish gray, almost white in some cases.

Juvenal pelage.—Pale grizzled gray with dusky undercolor showing through; top of tail and back of hind legs cinnamon buffy.

Skull.—In general proportions similar to that of *mearnsi* but much smaller.

Average measurements (*5 adults*).—Total length, 408; tail vertebræ, 52; hind foot, 99; ear from notch in dried skin, 50.

Remarks.—This is a pale form inhabiting the wooded borders of streams and prairies on the arid plains from western Minnesota and the eastern part of Nebraska west along the headwaters of the Platte River to the base of the Rocky Mountains near Denver and into southeastern Wyoming.

As in the case of *mearnsi*, these rabbits show considerable individual variation in the skull, some individuals having the rostrum proportionately considerably slenderer than others. A specimen from Dry Willow Creek, Yuma County, in northeastern Colorado, has the most slender rostrum of any examined. Another from Arvada, on Clear Creek, not far from Denver, has an unusually massive skull with a short rostrum, broad and heavy at base. In this last specimen the bullæ are a little larger than the average in the present form.

Total number of specimens examined 26, from:

Minnesota: Lac qui Parle, 1.
North Dakota: Portland, 1.
South Dakota: Fort Randall, 1.
Wyoming: Meriden, 1.
Nebraska: Kennedy, 1; Neligh, 2; Snake River (11 miles northwest of Kennedy), 3; Valentine, 3.
Kansas: Long Island, 9.
Colorado: Arvada, 1; Dry Willow Creek (Yuma County), 2; Masters, 1.

SYLVILAGUS FLORIDANUS ALACER (BANGS).

OKLAHOMA COTTONTAIL.

Lepus sylvaticus alacer Bangs, Proc. Biol. Soc. Washington, X, p. 136, December 28, 1896. Type from Stillwell, Oklahoma; No. 5480, ♀ yg. ad., Museum of Comparative Zoology (Bangs collection); collected by T. Surber, August 14, 1896.

Geographic distribution.—Gulf coast from Mobile Bay, Alabama, to Matagorda Bay, Texas, and thence north through most of Alabama to Tate, northwestern Georgia; all of Mississippi, Louisiana, and Arkansas; western Tennessee and Kentucky, extreme southern Illinois, southern Missouri, southeastern Kansas; all of Oklahoma except extreme western part, and eastern Texas to eastern border of Panhandle. Vertical range from near sea level in Louisiana up to about 2,000 feet altitude in Oklahoma; zonal range mainly Lower Austral.

General characters.—Size rather small, about as in typical *floridanus*, to which it has considerable resemblance, but paler, with more of a rusty reddish shade over entire upperparts, including legs, than in any other subspecies of *floridanus* in the United States. Skull small and slender, in general appearance approaching that of *chapmani.*

Color in fresh pelage.—Top of head and back deep ochraceous buff, more or less strongly washed with black, giving a rusty or reddish brown effect; sides of body paler or grayer than back; dingy grayish rump patch present but poorly marked; top of tail reddish brown; nape deep rusty rufous; outside of ears dull, slightly grayish buffy brown, bordered and tipped with black; orbit with a narrow ring of buffy surrounded by a broader area like top of head; sides of body paler and more grayish buffy brown than back; front and sides of fore legs rich deep ferruginous, becoming only a little paler on tops of fore feet; outside and back of lower part of hind legs dull cinnamon or rusty rufous with a slightly paler shade of same extending along sides of hind feet, and shading into pale rufous or pale rusty buff on tops of feet; underside of neck deep dull buff varying to dull dark ochraceous buff.

Color of faded pelage.—Much paler on upperparts, usually with more or less of a rusty suffusion.

Skull.—Nearly as long as that of *floridanus*, but slenderer and lighter throughout; closely similar in general appearance to that of *chapmani*, except for its greater size and proportionately smaller bullæ; supraorbital processes broad, with a well-marked incised anteorbital notch and broad postorbital process, usually with tip for from one-third to one-half its length along inner side resting against the skull and inclosing a small, flattened foramen; rostrum narrower and slenderer than in *floridanus;* braincase narrower; molar series much heavier and bullæ smaller.

Average measurements (5 adults).—Total length, 418; tail vertebræ, 56; hind foot, 92; ear from notch in dried skin, 52.

Remarks.—In color the present form most closely resembles *mallurus*, but averages much more rusty reddish. Its decidedly smaller size, shorter ears, and smaller, lighter skull are also well-marked points of distinction between it and *mallurus.*

East of the Mississippi River, as far as Mobile Bay and western Tennessee, the typical reddish color of the upperparts is present, but the size is decidedly larger than in typical specimens, and the skull is often scarcely, or not at all, distinguishable from that of *mallurus*, the animals of this region being intergrades. To the north it intergrades with *mearnsi* and to the west, along the border between the humid timbered section of east Texas and the arid, treeless plains of that State, it intergrades with *chapmani.* The change from *alacer* at Port Lavaca to typical *chapmani* a little farther west is very abrupt. Northward, at Cuero, Gurley, Llano, Clyde, and Brazos, intermediates between the two forms occur, but usually they are nearer one form or the other. Frequently specimens almost typical of both forms occur in these intermediate localities.

A series of March specimens from Mount Scott, Oklahoma, and two skins taken the same month at Gurley, Texas, are unusually pale, apparently owing to bleaching. Two fine fall and early winter skins from Stuttgart, Arkansas, and Avery, Louisiana, are very dark rich rusty brown, and the color of worn specimens from other points of the lower Mississippi indicate that *alacer* reaches its most intensely colored condition in this part of its range, with the deepest suffusion of rusty on the back and darkest ferruginous on the nape and legs. The Mount Scott, Oklahoma, specimens are the palest and least rusty, with the fore legs pale rufous and with but little rusty on the hind legs. One skull from Mobile, Alabama, is nearly typical *alacer*, while one from Washington, Mississippi, is much larger and heavier and more like that of *mallurus*, but the color of the pelage is that of true *alacer*, to which it must be referred. A specimen from Arlington, Tennessee, is also large with a large, *mallurus*-like skull but rusty reddish pelage. Summer specimens from several places in western Tennessee are darker and more rufous than typical *alacer*, but their skulls are scarcely distinguishable from *mearnsi*. In the present instances it appears to give the most logical results to consider the color as the determining factor in the separation of *alacer* from *mallurus* and *mearnsi*. At Wichita, Kansas, they are intergrades with *mearnsi*, but are nearest *alacer*.

A series of specimens taken by A. H. Howell during the summer and fall of 1908 shows that *alacer* ranges east throughout nearly all of Alabama to Tate, northwest Georgia.

Total number of specimens examined 126, from:

Alabama: Audubon, 4; Castleberry, 4; Huntsville, 3; Mobile Bay, 1; Scottsboro, 1.

Georgia: Tate, 1.

Mississippi: Bay St. Louis, 4; Fayette, 1; Holly Springs, 1; Michigan City, 1.

Louisiana: Alexandria, 1; Avery, 1; Belcher, 1; Cartville, 3; Foster, 1; Haughton, 1; Lake Catherine, 1; Lecompte, 1; Madisonville, 1; Mer Rouge, 2; Natchitoches, 1; Perry, 3; Pointe aux Loups Springs, 2; Rayne, 1.

Tennessee: Arlington, 2; Big Sandy, 2; Danville, 1; Raleigh, 1; Samburg, 1.

Missouri: Columbia, 3; Golden City, 1; Piedmont, 1; St. Louis, 2; Stone County, 2; Stotesbury, 2.

Arkansas: Stuttgart, 1.

Kansas: Belleplain 1; Chetopa, 1; Garden Plain, 1; Wichita, 3.

Oklahoma: Fort Cobb, 1; Fort Gibson, 1; Mount Scott, 8; Red Fork, 1; Savanna, 1; Stillwell, 13; Wichita Mountains, 1; Woodward, 1.

Texas: Brazos, 2; Canadian, 2; Decatur, 1; Gainesville, 2; Gurley, 4; Henrietta, 1; Indianola, 1; Jasper, 1; Joaquin, 1; Lipscomb, 1; Matagorda, 6; Mobeetie, 1; Port Lavaca, 1; Richmond, 1; Sour Lake, 4; Texarkana, 1; Vernon, 2; Virginia Point, 1.

SYLVILAGUS FLORIDANUS CHAPMANI (ALLEN).

TEXAS COTTONTAIL.

(Pl. IX, fig. 3.)

Lepus floridanus chapmani Allen, Bull. Am. Mus. Nat. Hist., N. Y., XII, pp. 12–13, March 4, 1899. Type from Corpus Christi, Texas; No. $\frac{1202}{2615}$, ♂ ad., American Museum of Natural History; collected by F. M. Chapman, April 10, 1891.

Lepus floridanus caniclunis Miller, Proc. Acad. Nat. Sci., Philadelphia, October, 1899, pp. 388–389. Type from Fort Clark, Texas; No. 63137, ♂ ad., U. S. National Museum; collected by Dr. E. A. Mearns, December 27, 1892.

Lepus simplicicanus Miller, Proc. Biol. Soc. Washington, XV, pp. 81–82, April 25, 1902. Type from Brownsville, Texas; No. 21805, ♀ ad., U. S. National Museum; collected by F. B. Armstrong, October 19, 1891.

Geographic distribution.—Arid parts of middle and southern Texas from east of Corpus Christi to mouth of Pecos River and from near Abilene south across the Rio Grande into northeastern Mexico to central Tamaulipas, most of Nuevo Leon, and northeastern Coahuila. Vertical range from sea level near Corpus Christi up to about 1,000 feet altitude near Fort Clark, Texas. Zonal range mainly Lower Sonoran.

General characters.—One of the smallest of the forms of *floridanus;* ears short; feet small; upperparts dark grayish buffy brown not tinged with rusty; skull light and slender with narrow rostrum, small molar series and small bullæ. Distinguished from its nearest geographic relative *alacer* by grayer color, smaller size, shorter ears, and slenderer feet; from *floridanus* by much grayer color, smaller size, and lighter skull.

Colors in fresh fall pelage.—Top of head and back dull, slightly pinkish, buff overlaid with a strong black wash, the buff deepest on middle of back; sides of body becoming grayish and less strongly washed with black; rump covered with a not strongly marked dark grayish patch; top of tail dusky brown grizzled with gray; outside of ears grayer than top of head and distinctly edged along front border and around tip with black; nape dark cinnamon rufous; front of fore legs similar to nape but paler and duller, becoming still paler on top of fore feet; outside and back of hind legs dull cinnamon brown or dull rusty cinnamon, the latter extending along sides of feet; tops of hind feet pale buffy whitish; underside of neck dull dark buffy or cinnamon buff; rest of underparts white.

Skull.—Smallest and lightest among the forms of *floridanus;* much like that of *orizabæ*, but rostrum slightly heavier; much smaller and lighter than in true *floridanus*, with braincase more rounded, and interorbital and frontal region narrower; rostrum slender and tapering rapidly anteriorly; bullæ small, proportionately about as in *floridanus;* jugals slender, usually with a well-marked groove, ending anteriorly in a distinct pit; front part of anteorbital process usually separated from skull by a distinct slit-like notch; postorbital process proportionately light, with posterior end resting broadly against skull and usually inclosing a narrow foramen, but sometimes closing against skull its entire length.

Average measurements (5 adults).—Total length, 403; tail vertebræ, 50.4; hind foot, 92; ear from notch in dried skin, 49.

Remarks.—A specimen taken at Corpus Christi on August 20 is very richly colored, with a heavy wash of glossy black overlying the deep pinkish buff ground color. This represents the extreme richness of the full pelage. The wearing away of the black hairs and fading of the underlying buff soon begin to change this into the paler and duller color usually seen. The pelage becomes most worn and faded in spring and summer and is sometimes quite gray, but most such specimens are more of a dull rusty buffy than when in fresh pelage.

S. f. chapmani ranges to the region about Fort Clark in western Texas, but between there and the Davis Mountains, where *robustus* is found, no member of this group is known to occur, and the material examined shows no sign of intergradation between the small, short-eared *chapmani* and the large, long-eared *robustus*.

An abundance of additional material, showing the extent of individual and seasonal variation, demonstrates the identity of Miller's *caniclunis* and *simplicicanus* with *chapmani*.

To the north and east *chapmani* grades into *alacer* and to the south into *connectens* and *orizabæ*.

Total number of specimens examined 127, from:

Texas: Alice, 1; Aransas County, 1; Beeville, 3; Blocker ranch, 1; Boerne, 1; Brownsville, 6; Camp Verde, 2; Clyde, 1; Comstock, 4; Corpus Christi, 21; Cuero, 1; Del Rio, 5; Eagle Pass, 1; Fort Clark, 12; Ingram, 2; Japonica, 3; Llano, 1; Mason, 5; Nueces Bay, 3; Rio Grande City, 1; Rockport, 7; Rock Springs, 2; San Antonio, 14; Stanton, 2; Sycamore Creek, 2; Victoria County, 2; Waring, 3.

Tamaulipas (Mexico): Jaumave, 1; Matamoras, 2; Mier, 2; Soto la Marina, 2; Victoria, 4.

Nuevo Leon (Mexico): Doctor Cos, 1; Lampazos, 1; Montemorelos, 2; Rodriguez, 2.

Coahuila: Monclova, 1; Sabinas, 2.

SYLVILAGUS FLORIDANUS HOLZNERI (MEARNS).

HOLZNER COTTONTAIL.

(Pl. X, figs. 1, 4.)

Lepus sylvaticus holzneri Mearns, Proc. U. S. Nat. Mus., XVIII, No. 1081, pp. 554–557, June 24, 1896. Type from Douglas Spruce Zone near summit of Huachuca Mountains, southern Arizona; No. 58937, ♀ ad., U. S. National Museum; collected by F. X. Holzner, August 29, 1893.

[*Lepus sylvaticus*] subspecies *rigidus* Mearns, Proc. U. S. Nat. Mus., XVIII, No. 1081, p. 555 (footnote), June 24, 1896. Type from Carrizalillo Mountains, Grant County, New Mexico (near Monument 31, Mexican boundary line); No. $\frac{20336}{35537}$, ♂ ad., U. S. National Museum; collected by Dr. E. A. Mearns and F. X. Holzner, April 21, 1892.

Lepus (Sylvilagus) durangæ Allen, Bull. Am. Mus. Nat. Hist., N. Y., XIX, p. 609 (author's separates published November 12, 1903). Type from Rancho Bailon, northwestern Durango, Mexico; No. 21377, ♀ ad., American Museum of Natural History; collected by J. H. Batty, May 12, 1903.

Geographic distribution.—Higher mountain ranges of extreme southern Arizona and southwestern New Mexico and thence south through the Sierra Madre of western Mexico, in northeastern Sonora, Chihuahua, Durango, western Zacatecas, northwestern Jalisco, and northern Tepic. Vertical range from about 6,000 to 10,000 feet in southwestern Chihuahua; zonal range mainly Transition and lower border of Canadian, ranging down into Upper Sonoran in winter.

General characters.—Larger than *chapmani* and much grayer, with more heavily furred feet; ears much larger and grayer with less black on border and tip; rufous on legs paler. Most like *S. f. subcinctus*, into which it grades on the southwestern part of the Mexican Tableland, but paler. Compared with *robustus* or *cognatus* a little darker and more buffy on upperparts.

Color in fresh winter pelage.—General color pale grayish buffy; top of head and back pale buff, often buffy gray, thinly washed and darkened with black, but becoming much grayer on sides of head and body; rump iron gray, forming a poorly marked rump patch; ears similar to top of head but grayer (paler than in *chapmani*) with only a slight darkening along border and at tips; nape rusty rufous varying from light ochraceous rufous to tawny rufous; fore legs a little paler rufous than nape; hind legs darker, more rusty rufous behind than front of fore legs, becoming ochraceous buff on sides of hind legs and feet; tops of feet white, usually with a buffy tinge; top of tail dull brown grizzled with gray; underside of neck grayish drab, sometimes pale and sometimes with more of a grayish buffy shade.

Skull.—Much like that of *subcinctus* but bullæ larger; proportionately broad across braincase; rostrum lighter and more rapidly tapering than usual in the forms of *floridanus*, but in this resembling *subcinctus*, *chapmani*, and *orizabæ;* supraorbital processes usually broad and heavy but compressed close to skull, especially along postorbital process, and inclosed foramen usually much reduced or nearly obsolete; anteorbital notch usually large and deep, more strongly marked than in *subcinctus* or *robustus*, the skulls of which those of *holzneri* most closely resemble. Specimens from the southern Sierra Madre of Mexico have heavier molars than those from the type region, thus grading toward *subcinctus*.

Average measurements (5 adults).—Total length, 425; tail vertebræ, 71; hind foot, 98; ear from notch in dried skin, 62.

General remarks.—This form in winter averages paler and grayer than *chapmani* or *subcinctus*, and varies from buffy iron gray to light pinkish buff, darkened by the overlying wash of blackish. It lives in mountains where there is more or less snowfall, except in the extreme southern part of its range, and the winter pelage is paler and more abundant than in summer, being very pale gray with white feet and pale rusty nape. The freshly molted pelage in summer is darker than at any other time and appears to become more abundant with the approach of winter.

Lepus rigidus and *Lepus durangæ* Allen are indistinguishable from *holzneri*. In the southern part of its range in Jalisco, Zacatecas, and southern Durango, *holzneri* becomes gradually darker on the upperparts until they pass into the darker *subcinctus* and through this last into the much darker *orizabæ*.

S. holzneri differs from *S. n. pinetis* externally in its rather more rusty buffy color, more grayish or drab underside to neck, larger size, and longer ears.

The skull, compared with that of *pinetis*, is proportionately narrower across the braincase with a heavier rostrum (broad and flattened over base and decurved anteriorly as in most forms of *floridanus*) and more closely set postorbital processes, which nearly or quite touch the skull along their inner borders.

Total number of specimens examined 56, from:

New Mexico: Animas Mountains, 1; Carrizalillo, 1: Burro Mountains, 3; San Luis Mountains, 5; Silver City, 1.

Arizona: Chiricahua Mountains, 4; Huachuca Mountains, 13.

Sonora (Mexico): Hall ranch (Guadalupe Canyon), 2; San José Mountains, 2.

Chihuahua (Mexico): Colonia Garcia, 3; Guadalupe y Calvo 1· San Luis Mountains, 1.

Durango (Mexico): Arroyo de Buey, 2; Cerro Prieto, 1; El Salto, 3; Guanacevi, 3; mountains near Guanacevi, 2; Inde, 1.

Zacatecas (Mexico): Hacienda San Juan Capistrano, 3; Plateado, 3; Valparaiso, 1.

SYLVILAGUS FLORIDANUS SUBCINCTUS (MILLER).

JALISCO COTTONTAIL.

Lepus floridanus subcinctus Miller, Proc. Acad. Nat. Sci. Philadelphia, October, 1899, pp. 386–388. Type from Hacienda El Molino, Negrete, Michoacan, Mexico; No. $\frac{32435}{35665}$, ♀ ad., U. S. National Museum; collected by P. L. Jouy, June 15, 1892.

Geographic distribution.—Mainly arid plains of southwestern part of Mexican Tableland and from western Guanajuato to northern Michoacan and southeastern Jalisco. Vertical range from about 3,500 to 6,000 feet altitude in Jalisco; zonal range mainly Upper and Lower Sonoran, but extends down into upper border of Arid Tropical Zone.

General characters.—Size small, color of upperparts buffy gray; similar in general appearance to *holzneri* but size smaller; ears shorter; back darker gray, and rufous on legs darker.

Color in fresh winter pelage.—Top of head and back varies from pale grayish buff to creamy buff washed and darkened with blackish; sides of body and rump grayer; top of tail dingy brown grizzled with grayish; underside white; ears similar to top of head but grayer and narrowly bordered with blackish around front border and at tip; nape rusty rufous (near tawny ochraceous of Ridgway); fore legs similar but more of a cinnamon rufous and shading into ochraceous buff on fore feet; hind legs a darker shade of cinnamon rufous varying to nearly clay color and shading to buff or ochraceous buff on hind feet; underside of neck varying from dull cream buff to clay color.

Skull.—Similar to *orizabæ*, but larger, rostrum similarly short and tapering; also much like that of *holzneri*, but smaller, with smaller bullæ, slenderer rostrum, and slightly broader, heavier molars; rostrum heavier than in *orizabæ*, but lighter than in *chapmani;* interorbital breadth proportionately great, broader even than in *holzneri;* bullæ rather large compared with *chapmani.*

Average measurements (*5 adults*).—Total length, 400; tail vertebræ, 51; hind foot, 91; ear from notch in dried skin, 57.

Remarks.—*S. f. subcinctus*, *holzneri*, *orizabæ*, and *chapmani* are very similar in general color, but the legs of *chapmani* are much paler or less rufous than the others, and those of *subcinctus* are more rufous. *S. subcinctus* is an intergrading form between *orizabæ* and *holzneri.* The type is a large old adult with a decidedly heavier skull than any other specimen seen from the district about the type locality, and has a close resemblance to the skull of *restrictus*, but the color at once distinguishes it. The range of *subcinctus* lies just to the north and east of, and immediately adjoining, that of *restrictus*, and the two intergrade.

Total number of specimens examined 30, from:

Jalisco (Mexico): Ameca, 1; Atemajac, 7; Etzatlan, 11; La Barca, 2; Lagos, 2; Ocotlan, 2.

Michoacan (Mexico): Acambaro, 1; Negrete, 2; Querendaro, 2.

SYLVILAGUS FLORIDANUS RESTRICTUS NELSON.

MICHOACAN COTTONTAIL.

Sylvilagus floridanus restrictus Nelson, Proc. Biol. Soc. Washington, XX, p. 82, **July 22, 1907.** Type from Zapotlan, Jalisco, Mexico; No. $\frac{33667}{45722}$, ♂ ad., U. S. National Museum (Biological Survey collection); collected by E. W. Nelson, April 25, 1892.

Geographic distribution.—Mainly oak and pine forested slopes of Sierra Madre in Michoacan, southern and western Jalisco, and southeastern part of Territory of Tepic, Mexico. Vertical range from about 4,000 to 9,500 feet in Michoacan; zonal range mainly Upper Sonoran and Transition, but ranging down on south slope of Sierra Madre through Lower Sonoran to border of Arid Tropical Zone.

General characters.—Similar to *subcinctus* in size, but decidedly more rusty or reddish (almost as in *aztecus*), with the rufous on legs much more intense and brighter than in any other form found about the Mexican Tableland.

Color in nearly fresh winter pelage.—Top of head and upperparts of body varying from pinkish buff to deep ochraceous buff with a strong wash of black; sides of rump a little grayer than back; ears ochraceous brown, grayer than top of head, and narrowly edged about anterior border and at tip with black; nape deep rusty rufous (dark ochraceous rufous of Ridgway); fore legs deep cinnamon rufous, rather paler than nape, and shading into deep ochraceous buff on fore feet; back of hind legs dark cinnamon rufous, becoming lighter on sides of hind feet, and pinkish buff to ochraceous buff on top of hind feet; underside of neck deep cream buff; rest of underparts white.

Skull.—Much like that of *subcinctus*, but in typical specimens the rostrum decidedly heavier and less tapering toward tip; interorbital breadth narrower; also resembling that of *holzneri*, but rostrum rather heavier and less pointed and bullæ smaller. Specimens from Patzcuaro have rostrum light and pointed, closely approaching that of *subcinctus;* near Zapotlan and thence to Tepic, rostrum heavy and typical in form.

Average measurements (*5 adults*).—Total length, 422; tail vertebræ, 54; hind foot, 93; ear from notch in dried skin, 59.5.

Remarks.—This subspecies is based mainly on color. It differs from all the other forms found about the Tableland in the amount and intensity of its reddish or rusty color. In fresh pelage it sometimes even exceeds dark specimens of typical *floridanus* in the intensity of the rusty or rufous of the upperparts, especially on the nape and legs. In general, the color closely resembles that of *aztecus*, *russatus*, and the other large reddish southern subspecies. A specimen in fine winter pelage, taken March 3 on Mount Tancitaro, Michoacan, is unusually brightly colored. The back is deep ochraceous buff darkened with a wash of black, the sides and rump a little grayer, and the legs deep cinnamon rufous.

The range of this subspecies is restricted to a long belt of forested country following the slopes of the Sierra Madre through most of Michoacan and thence west into southern Jalisco to the Sierra Nevada de Colima and from there southwest to the city of Tepic. It possesses one of the most limited ranges among the Mexican forms. The reddish color ordinarily separates it at once from the gray *subcinctus* living on the adjacent arid plains to the north. Two specimens taken at Zapotlan, Jalisco, on April 27 differ from others of the series taken at that locality, and elsewhere within the range of *restrictus*, in being as gray as typical specimens of *subcinctus*, but their skulls are like the rest of the series from Zapotlan.

A skull from the city of Tepic, Territory of Tepic, is typical *restrictus*, but unfortunately I have no skin from there. An adult female, taken March 23 southeast of the city of Tepic at 6,500 feet altitude on the pine forested highlands at Laguna, Sierra de Juanacatlan, in central western Jalisco, differs so much in skull characters and in general appearance from both *restrictus* and *subcinctus* that I hesitate to place it with either. Awaiting further material from that district I have placed it with *restrictus*—the form which its skull characters most resemble. Its color, however, is grayish, more like *subcinctus* than *restrictus*. The skull of this specimen measures: Basilar length, 58; length of nasals, 33.8; breadth of rostrum above premolars, 21.2; depth of rostrum in front of premolars, 15.3; interobital breadth, 19.5; parietal breadth, 27.8; diameter of bullæ, 11.2. The frontal area, including base of rostrum, is very broad and arched; the supraorbital processes are small and depressed below the plane of the frontal region instead of being as usual raised winglike above it. The jugals are heavy, especially at anterior angle. The skin measures: Total length, 455; tail vertebræ, 49; hind foot, 101.

Since writing the foregoing I have received for comparison through the courtesy of Doctor Allen, of the American Museum of National History, a series of cottontails collected by the late J. H. Batty from several localities along the borderline between western Jalisco and Tepic. They agree with the Biological Survey series from Zapotlan, and show the continuous distribution of *restrictus* from the type locality northwestward along border of Tepic.

Total number of specimens examined 53, from:

Jalisco (Mexico): Atenguillo, 1; Estancia, 2; Garabatos, 3; La Cienega, 2; La Laguna, 2; Las Canoas, 6; Llano y Casco, 2; Rio Ameca, 3; Zapotlan, 9.

Michoacan (Mexico): Los Reyes, 1; Mount Tancitaro, 1; Patzcuaro, 19.

Territory of Tepic (Mexico): Ojo de Agua (near Amatlan), 1; city of Tepic, 1.

SYLVILAGUS FLORIDANUS ORIZABÆ (MERRIAM).

MOUNT ORIZABA COTTONTAIL.

Lepus orizabæ Merriam, Proc. Biol. Soc. Washington, VIII, p. 143, December 29, 1893. Type from Mount Orizaba, Puebla, Mexico; No. 53318, ♀ ad., U. S. National Museum (Biological Survey collection); collected by E. W. Nelson and E. A. Goldman, April 24, 1903.

Lepus floridanus persultator Elliot, Pub. Field Columbian Mus., Zool. ser., III, pp. 147–148, March, 1903. Type from City of Puebla, Puebla, Mexico; in Field Columbian Museum; collected by F. E. Lutz, May 9, 1901.

Geographic distribution.—Most of the high mountains and bordering plains on southeastern part of Mexican Tableland, from Mount Orizaba and the Cofre de Perote on the western border of central Vera Cruz through northern half of Puebla, all of Tlaxcala, most of the State of Mexico, the Federal District, Hidalgo, Guanajuato, San Luis Potosi, and southern Coahuila. Vertical range from about 7,000 to over 14,000 feet altitude in eastern Puebla; zonal range from

Upper Sonoran through Transition to the Arctic-Alpine division of the Boreal Zone (mainly Transition).

General characters.—Smallest and darkest gray of the Mexican subspecies of *floridanus;* much like *chapmani* in general appearance, but darker gray; nape and legs a deeper or darker shade of rufous; and ears larger.

Color in fresh winter pelage.—Dark, nearly iron gray, with a buffy tinge on top of head, back, and sides of body (dark grayish, heavily suffused with dull ochraceous-buff on top of head and back of some individuals); sides of rump grayer than back, but rump patch not well marked; ears a little grayer than back, with a narrow edging of black about anterior border and at tip; nape deep rusty rufous; legs a duller more tawny shade of same, becoming dull chestnut on back of hind legs; rufous color of legs shades into ochraceous buff or buffy white on feet; top of tail dusky brown, grizzled with gray; underside of neck creamy clay color; rest of underparts white.

Skull.—Small and light, much as in *chapmani*, but with a rather longer, much slenderer, and more pointed rostrum; bullæ proportionately large.

Average measurements (*5 adults*).—Total length, 375; tail vertebræ, 39; hind foot, 87; ear from notch in dried skin, 59.

Remarks.—Winter specimens have unusually long and full pelage, darkened on the upperparts by an abundance of long black-tipped hairs. As the latter wear off, the general color becomes paler and grayer, especially in late spring.

Orizabæ differs from *subcinctus* mainly in its smaller size and darker, more iron gray upperparts. It ranges over the open forests on the slopes of the mountains and foothills on the central southern and extreme southeastern part of the Tableland and in suitable places on the adjacent high plains. On Mount Orizaba we found them living in scanty patches of dwarfed evergreen shrubs above timberline (13,800 feet), and their tracks were seen up to above 14,000 feet. From there they range down the west slope through open pine forest to the plains of Puebla. Specimens from the mountains along the backbone of the Tableland in southern San Luis Potosi and through Guanajuato, while not typical, appear nearest to *orizabæ*.

The type locality of *Lepus persultator* Elliot is the city of Puebla, Puebla, in the midst of the range of *S. f. orizabæ*. The type of *persultator*, a worn spring specimen, proves on comparison to be identical with *orizabæ*, and thus the name becomes a synonym of *orizabæ*.

S. f. orizabæ is the most generally distributed cottontail on the mountain sides and foothills about the Valley of Mexico. In Queretaro and Michoacan it intergrades with *subcinctus*, and in San Luis Potosi and adjacent region with *chapmani*.

Total number of specimens examined 49, from:

Coahuila (Mexico): Sierra Encarnacion, 1.
San Luis Potosi (Mexico): San Luis Potosi, 1.
Guanajuato (Mexico): Santa Rosa, 5.
Hidalgo (Mexico): El Chico, 5; Encarnacion, 2; Tulancingo, 6; Zimapan, 2.
Mexico (Mexico): Mount Popocatepetl, 1; Volcano of Toluca, 8.
Federal District (Mexico): Tlalpam, 8.
Tlaxcala (Mexico): Huamantla, 2.
Puebla (Mexico): Chalchicomula, 1.
Vera Cruz (Mexico): Las Vigas, 5; Mount Orizaba, 2.

SYLVILAGUS FLORIDANUS CONNECTENS (Nelson).

Alta Mira Cottontail.

Lepus floridanus connectens Nelson, Proc. Biol. Soc. Washington, XVII, p. 105, May 18, 1904. Type from Chichicaxtle, central Vera Cruz, Mexico; No. 63660, ♂ ad., U. S. National Museum (Biological Survey collection): collected by E. W. Nelson and E. A. Goldman, February 15, 1894.

Geographic distribution.—Coastal plain and eastern slope of adjacent mountains of eastern Mexico from Alta Mira, in southern Tamaulipas, through eastern San Luis Potosi to Pinal de Amoles, in northeastern Queretaro, south to Papaloapam River in Vera Cruz, and through eastern Puebla to Mount Zempoaltepec in eastern Oaxaca. Vertical range from sea level near Vera Cruz up to about 9,000 feet on Mount Zempoaltepec; zonal range mainly Arid and Humid Tropical, extending up through Upper Sonoran Zone.

General characters.—Large, nearly equaling *aztecus* in size, and resembling *russatus* and *aztecus* in its generally reddish coloration, but with much larger ears than either and with the rufous on hind legs much duller.

Color in fresh winter pelage.—Top of head and back deep ochraceous buff heavily washed with black; sides of body and rump a little paler; top of tail rusty brown; ears dark buffy brown washed with black; latter color strongest along anterior edge and at tip; nape deep rusty rufous; fore legs rusty cinnamon, shading into ochraceous buff on fore feet; back of hind legs deep rusty brown, varying from rusty cinnamon to dark russet, becoming paler on sides of feet; tops of hind feet vary from white to dark buff; underside of neck dark creamy buff; rest of underparts white.

Skull.—Most like *aztecus*, especially in the shape of the heavy rostrum, but with braincase a little broader; bullæ distinctly larger; jugal distinctly grooved, with a pit anteriorly, as in *aztecus;* skull longer and proportionately narrower than in typical *floridanus.* The larger size, as well as the broad, heavy rostrum with nasals inflated and decurved near tip, serve to distinguish *connectens* at a glance from *chapmani* and *orizabæ;* rostrum not so deep as in *chapmani;* interorbital breadth great, equaling true *floridanus* and proportionately about as in *aztecus;* the broad interorbital area and small bullæ distinguish it from *russatus.*

Average measurements (*5 adults*).—Total length, 434; tail vertebræ, 58; hind foot, 94; ear from notch in dried skin, 60.

Remarks.—*S. f. connectens* ranges from the more scantily forested coastal plains, which are arid tropical in character, up through the adjacent humid tropical mountain slopes, wherever natural or artificial openings occur in the heavy forest. Specimens from this humid belt average darker colored than those from the more arid plains, but the differences do not appear to be constant enough to distinguish them. In the dry season specimens from the more arid coastal region average paler than those from the more humid mountain slopes.

As in most other forms of this species, *connectens* shows a considerable range of individual variation and also varies geographically as it grades toward *chapmani* on the north and *russatus* on the south.

Total number of specimens examined 47, from:

Tamaulipas (Mexico): Alta Mira, 6.
Vera Cruz (Mexico): Chichicaxtle, 8; Jico, 15; Mirador, 1; Orizaba City, 1.
San Luis Potosi (Mexico): Valles, 4.
Queretaro (Mexico): Pinal de Amoles, 5.
Puebla (Mexico): Metlaltoyuca, 3.
Oaxaca (Mexico): Mount Zempoaltepec, 4.

SYLVILAGUS FLORIDANUS RUSSATUS (ALLEN).

VERA CRUZ COTTONTAIL.

Lepus (*Sylvilagus*) *russatus* Allen, Bull. Am. Mus. Nat. Hist., XX, p. 31, February 29, 1904. Type from Pasa Nueva, southern Vera Cruz, Mexico; No. 17203, ♂ ad., American Museum of Natural History; collected by A. E. Colburn, April 10, 1901.

Geographic distribution.—Coast lowlands of southern Vera Cruz and thence east into adjacent part of Tabasco and south to lower slopes of the Cordillera. Vertical range from sea level to about 3,000 feet in southern Vera Cruz; zonal range Humid and Semi-humid Tropical.

General characters.—A well-marked subspecies of medium size and reddish color, with very short dark ears and dark rufous legs; skull narrow; interorbital breadth narrow; bullæ proportionately large.

Color in nearly fresh winter pelage.—Top of head and back ochraceous buff, rich and dark in fresh pelage; sides of body and rump paler; a wash of black darkening sides and top of head and upperparts of body; ears with a blackish wash, darker than crown, and becoming heaviest along anterior border and about tip; nape bright, almost orange, rufous; fore legs cinnamon rufous shading to ochraceous buff on tops of fore feet; back of hind legs dull cinnamon rufous, becoming paler and duller on sides of hind feet; tops of hind feet clear white or buffy white; top of tail dusky brown, grizzled with ochraceous buff; underside of neck rusty ochraceous buffy; rest of underparts buffy white.

Skull.—Interorbital breadth very narrow, less than in any other Mexican form; bullæ proportionately larger than in any others; rostrum heavy, with inflated nasals and broad, decurved tip.

The heavy jugals and narrow braincase show its close relationship with *aztecus*, *connectens*, *yucatanicus*, and *chiapensis*. Skull proportionately much narrower than in typical *floridanus;* jugals about the same, but with a shallow groove and pit at anterior end nearly or quite lacking.

Average measurements (*5 adults*).—Total length, 416; tail vertebræ, 45; hind foot, 89; ear from notch in dried skin, 51.

Remarks.—In color this form is much like *aztecus* and others of the related tropical forms in Mexico and decidedly more rusty yellowish than true *floridanus.* It has a rather restricted range, as far as known, being confined mainly to the hot semiarid tropical lowlands of southern Vera Cruz. Its small, short, and dark-colored ears and marked skull characters at once distinguish it from other Mexican forms. In faded pelage it is more buffy than *aztecus.*

Total number of specimens examined 21, from—

Vera Cruz (Mexico): Catemaco, 6; Coatzacoalcos, 2; Minatitlan, 12; Pasa Nueva, 1.

SYLVILAGUS FLORIDANUS AZTECUS (ALLEN).

AZTEC COTTONTAIL.

Lepus sylvaticus aztecus Allen, Bull. Am. Mus. Nat. Hist., N. Y. III, p. 188 (author's separates published December 10, 1890). Type from Tehuantepec City, Oaxaca, Mexico; No. $\frac{3116}{2438}$, ♂ ad., American Museum of Natural History; collected by Dr. Audley C. Buller, February 19, 1890.

Geographic distribution.—Coastal plain and adjacent foothills of southern Oaxaca and southeasterly along coast of Chiapas nearly or quite to border of Guatemala, and also middle-northern Costa Rica. Vertical range from sea level to about 2,000 feet altitude in southern Oaxaca; zonal range Arid and Semi-humid Tropical zones.

General characters.—A large form, larger than typical *floridanus;* color similar to that of *russatus*, but larger, with much longer ears, and more brightly colored hind legs and feet; skull large.

Color in fresh winter pelage.—Head and upperparts of body rich ochraceous buff, becoming paler or grayer on sides of body and rump (still paler or grayer in faded or worn pelage); nape deep rusty rufous (orange rufous); fore legs rich cinnamon rufous, shading to ochraceous buff on feet; hind legs a duller cinnamon rufous, strongly contrasting with the clear white, or bright buffy white, on front of legs and top of hind feet; top of tail rusty brown, often with a cinnamon rufous shade; underside of neck ochraceous clay color; rest of underparts white.

Skull.—Large; rostrum long and heavy, with nasals inflated and decurved near tip; braincase narrow; interorbital area broad, much broader than in *russatus;* bullæ very small (as in *chiapensis*). Skull most like *chiapensis*, but smaller, with narrower rostrum and interorbital area. Compared with true *floridanus*, the skull is longer and proportionately slenderer, with interorbital area averaging broader; braincase actually, as well as proportionately, narrower and bullæ much smaller; jugal heavy, and usually with a distinct groove ending anteriorly in a well-marked pit; nasals average longer and proportionately narrower; base of rostrum more elevated, giving a more arched outline to upper surface of skull in front; braincase more elongated and outline less abruptly descending at occiput.

Average measurements (5 *adults*).—Total length, 444; tail vertebræ, 54; hind foot, 97; ear from notch in dried skin, 58.

Remarks.—General color much as in *russatus* and *chiapensis*, but the hind legs and hind feet are much more brightly colored, the cinnamon rufous and the white areas being clearer and more sharply contrasted.

Until recently I supposed that no form of *Sylvilagus floridanus* ranged beyond Guatemala. Recent collections, however, prove that this species occurs as far at least as middle Nicaragua and even to Tenorio, northern Costa Rica. The single specimen known to me from Costa Rica was collected January 30, 1908, by C. F. Underwood, and is in the Museum of Comparative Zoology. As stated elsewhere, the Nicaragua specimens examined by me are referable to *chiapensis*, which is surprising in view of the fact that the single known Costa Rica specimen is very brightly colored and, with the exception of being a little grayer on the ears and a little more dusky on top of the tail, is not distinguishable from *S. f. aztecus* from Tehuantepec, Oaxaca, Mexico. The skull characters also, including the smaller bullæ, are the same. This appears to be a case of parallel development, since *chiapensis* intervenes in the territory between Oaxaca and Costa Rica.

Total number of specimens examined 42, from:

Oaxaca (Mexico): Huilotepec, 27; Juchitan, 1; Salina Cruz, 1; San Mateo del Mar, 6; Santa Efigenia, 3; Santa Maria Petapa, 1; Tapana, 1; Tehuantepec City, 1.

Costa Rica: Tenorio, 1.

SYLVILAGUS FLORIDANUS CHIAPENSIS (NELSON).

CHIAPAS COTTONTAIL.

Lepus floridanus chiapensis Nelson, Proc. Biol. Soc. Washington, XVII, p. 106, May 18, 1904. Type from San Cristobal, Chiapas, Mexico; No. 75953, ♀ ad., U. S. National Museum (Biological Survey collection); collected by E. W. Nelson and E. A. Goldman, September 28, 1895.

Geographic distribution.—Interior of Chiapas, mainly in the highlands, the adjacent highlands of Guatemala and southerly to middle-northern Nicaragua. Vertical range from about 2,000 to over 10,000 feet altitude in Chiapas and Guatemala; zonal range mainly upper Sonoran and Transition but ranges down to upper border of Tropical Zone.

General characters.—Largest of the subspecies of *floridanus;* pelage coarse; color of upperparts ochraceous buff, similar in size and general color to *aztecus* and *yucatanicus* but darker, with hind legs duller colored and underside of neck darker.

Color in fresh winter pelage.—Top of head and back dark ochraceous buff, heavily washed with black; sides of body and rump paler or grayer; ears darker and more clay colored than crown, with a distinct wash of blackish, becoming heaviest along anterior border and at tip; upperside of tail dull rusty brown; nape deep rusty rufous; fore legs vary from russet to deep cinnamon rufous, shading to ochraceous buff on fore feet; hind legs vary from dull cinnamon to dull cinnamon rufous becoming more tawny ochraceous on sides of feet; tops of hind feet dull ochraceous buff; underside of neck nearly wood brown, darker and duller colored than in *aztecus;* underparts of body mainly similar to sides; insides of legs mainly ochraceous buff, limiting the dingy whitish area on underside to a band along ventral line; chin and throat dingy gray.

Skull.—Large and massive, largest of all the forms except *yucatanicus*, with which it agrees closely in size, but is a little shorter and narrower both in interorbital and parietal breadth; bullæ smaller and jugals lighter; skull larger and heavier than in *aztecus*, with rostrum much broader at base but about the same in depth; jugal more deeply grooved, with a deep pit anteriorly; bullæ smallest among the Mexican forms, except *aztecus*, with which they agree in size but proportionately smaller.

Average measurements (*5 adults*).—Total length, 463; tail vertebræ, 52; hind foot, 97; ear from notch in dried skin, 60.

Remarks.—This is a very large, coarsely pelaged cottontail, which appears to range from the highlands of Chiapas southerly through the interior of Central America to northern Nicaragua.

In a recent paper on a collection of mammals from Nicaragua[a] Dr. J. A. Allen publishes the first record of the occurrence of a form of *Sylvilagus floridanus* in Nicaragua. Three specimens were sent the American Museum of Natural History from middle northern Nicaragua in the region about Matagalpa, and another specimen from the same region is in the collection of the Biological Survey. Doctor Allen identified his specimens as *S. f. chiapensis.* In color they are perfectly typical *chiapensis*, but are smaller, with shorter ears and hind feet. The skull is smaller than typical *chiapensis*, with proportionately wider interorbital breadth and larger bullæ. However, these differences do not appear to be sufficiently marked to be worth more than passing notice, and I agree with Doctor Allen's identification. The Biological Survey specimen from the same region is not fully grown, though in fresh adult pelage, and is brighter colored than the others, thus approaching *aztecus.*

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[a] Bull. Am. Mus. Nat. Hist., N. Y., XXIV, pp. 647–670, Oct. 13, 1908.

Total number of specimens examined 28, from:

Chiapas (Mexico): Canjob, 1; Comitan, 1; San Bartolome, 3; San Cristobal, 8; San Vicente, 8; Tuxtla, 1.
Guatemala: Hacienda Chancol, 1; Jacaltenango, 1.
Nicaragua: Chontales, 1; Jinotega, 1; Leon, 1; Ocotal, 1.

SYLVILAGUS FLORIDANUS YUCATANICUS (MILLER).

YUCATAN COTTONTAIL.

(Pl. IX, figs. 4, 6.)

Lepus floridanus yucatanicus Miller, Proc. Acad. Nat. Sci. Philadelphia, October, 1899, pp. 384, 386. Type from Merida, Yucatan, Mexico; No. $\frac{11441}{37772}$, ♀ ad., U. S. National Museum; collected by A. Schott, February 22, 1865.

Geographic distribution.—Coastal plain of Yucatan, Campeche, and Tabasco. Vertical range from sea level to about 500 feet in Campeche. Zonal range Arid and Semi-Arid Tropical zones.

General characters.—Size large; the largest of the subspecies of *floridanus* except *chiapensis;* pelage coarse; color rusty yellowish, much like *aztecus;* skull very large and massive with great interorbital breadth and supraorbital processes, including postorbitals, often fused to skull as thoroughly as in the swamp rabbits.

Color in nearly fresh winter pelage.—Top of head and back rusty ochraceous buff as in *aztecus*, but sides of head, body, and rump distinctly paler or more grayish; outside of ears grayer and narrowly edged along front border and tipped with blackish; top of tail rusty brown as in *aztecus;* nape deep rusty rufous; fore legs dull cinnamon rufous shading into ochraceous buff on feet; hind legs rusty cinnamon behind, varying to mars brown, and becoming paler on sides of feet; tops of feet white, sometimes shaded with buffy but paler than in *chiapensis;* underside of neck varies from dark creamy buff to dull clay color; rest of underparts white.

Skull.—This subspecies averages rather smaller than *chiapensis*, but skull larger and more massive (the largest among the forms of *floridanus*), with broad heavy rostrum and broad interorbital and frontal area; bullæ decidedly larger than in either *aztecus* or *chiapensis* and same actual size as in true *floridanus*, *holzneri*, and *russatus*, though proportionately smaller. Although a much larger and heavier animal than true *floridanus*, it has decidedly smaller molars; jugal heavy, usually with a groove ending in a decided pit anteriorly; supraorbital processes commonly more or less completely fused to skull, often as in typical specimens of swamp rabbits.

Average measurements (*5 adults*).—Total length 461; tail vertebræ, 60; hind foot, 97; ear from notch in dried skin, 61.

Remarks.—*Yucatanicus* is much like *aztecus* in color, but a little paler, with the light and rufous areas on the feet and legs less intense and not so strongly contrasted with the color of adjoining parts. One of the strong characters is the extent to which the postorbital process is fused to the skull, thus, in combination with the generally heavy proportions of the skull, producing a close general similarity to the skulls of the swamp rabbits.

Total number of specimens examined 15, from:

Campeche (Mexico): Campeche City, 3.
Yucatan (Mexico): Merida, 8; Progreso, 4.

SYLVILAGUS COGNATUS (NELSON).

MANZANO MOUNTAIN COTTONTAIL.

Lepus cognatus Nelson, Proc. Biol. Soc. Washington, XX, p. 82, July 22, 1907. Type from 10,000 feet altitude, near summit of the Manzano Mountains, New Mexico; No. 136569, ad., U. S. National Museum (Biological Survey collection); collected by A. Rea, February, 1905.

Geographic distribution.—High mountain summits and adjacent slopes of central-eastern New Mexico. Vertical range from about 6,500 to 10,200 feet altitude on Manzano Mountains; zonal range mainly Transition, and lower part of Canadian Zone.

General characters.—Color of upperparts light buffy grayish, as in *S. robustus*, but a little browner or more buffy on the ears; skull smaller with more slender supraorbitals and smaller bullæ.

Color in fresh pelage.—Top of head and back dull buffy grayish darkened with wash of black; rump dull iron gray, forming a fairly distinct patch; top of tail buffy brown washed with gray; orbital area rusty buff; sides of head and body dingy iron gray, tinged slightly with buff; nape light rusty rufous; sides of neck and fore part of shoulders underlaid with dull rusty buff strongly overlaid with dull buffy gray; outside of ears slightly buffy gray, paler than back and slightly edged with blackish about terminal third in front; front and sides of legs pale rusty, shading into buffy whitish on tops of fore feet; back and outside of lower hind legs and outside of hind feet rather pale dull rusty cinnamon, washed or overlaid with gray tips to hairs; tops of hind feet white; underside of neck pale buffy grayish underlaid with light plumbeous gray; among five specimens one has the underside of neck pale grayish buff underlaid with rather dark dull rusty buff.

Skull.—Closely resembles that of *holzneri*, but a little larger with smaller bullæ; a similarly deep notch in front of supraorbital, but supraorbital itself much lighter and narrower with a more slender and tapering postorbital process standing well out from skull, giving a more winglike appearance, and touching skull only at or very near posterior tip, thus inclosing a well-marked flattened, tear-shaped foramen; bullæ distinctly smaller than in *holzneri* and much smaller than in *robustus*.

Average measurements (*5 adults*).—Total length, 451; tail vertebræ, 65; hind foot, 102; ear from notch in dried skin, 67.

Remarks.—The present species with *S. robustus* and *S. f. holzneri* make up a group of pale gray mountain cottontails which have relatively long ears and certain skull peculiarities which make them appear very different from the ordinary forms of *floridanus*. The nearly straight upper outline of the rather slender tapering rostrum is most like that of *chapmani*, among the forms of *floridanus* found in the United States, but so far as known none of these forms intergrade with *chapmani*. Direct intergradation of *holzneri* with *floridanus* takes place at the southern end of the Mexican Tableland through *subcinctus*, *orizabæ*, and other forms along the Gulf coast. In *cognatus*, as in the case of both *robustus* and *holzneri*, there is considerable individual variation in the skull and especially in the size of the bullæ.

The topotypes of the present form from Tajique ranch, at 10,000 feet altitude, near the highest part of the Manzano Mountains, vary comparatively little in size, but a specimen from a short distance away and lower down on the east slope of the extreme south end of the range is larger in general dimensions and has much longer ears, about as in *robustus*, but the skull is only a little larger than the average and agrees with those from Tajique. The type measures as follows in the dried skin: Total length, 390; hind foot, 100; length of ear from notch, 68. Compared with *robustus* the skull is smaller and lighter with much smaller bullæ and narrower or more slender supraorbital and slenderer, more tapering postorbital processes.

Just what the range of this form is remains to be determined. Specimens in the Biological Survey collection from the Capitan Mountains and from north of Santa Rosa, New Mexico, belong here, and it will probably be found on all suitable mountain elevations in central New Mexico, east of the Rio Grande. Possibly the rabbits of the top of the Sacramento and Guadalupe mountains are of this form, or may be intergrades between it and the closely related *robustus*.

As in the case of *robustus* and *holzneri*, in winter this rabbit has a heavy coat with large, thickly furred feet, very different in appearance from the ordinary short-haired forms of *floridanus* from lower altitudes. It agrees also with *S. n. pinetis* in its abundant pelage, but is much paler and grayer. There is also considerable resemblance between the skulls of *cognatus* and *pinetis*, but the broader rostrum, heavier supraorbitals, and narrower braincase distinguish the former.

The skull of *cognatus* suggests that of *robustus*, *holzneri*, and *pinetis* in various characters, but the entire set of seven specimens from the Manzano and Capitan mountains has smaller bullæ.

A single specimen, taken at about 9,000 feet on the Datil Mountains in central New Mexico, is provisionally referred to the present form, though it is grayer (less washed with black) on the upperparts than any of the Manzano Mountain specimens, but, like one of these, has the underside of the neck pale, slightly buffy, gray underlaid with pale lead gray; the ears are also paler gray. The skull differs from that of typical *cognatus* in the narrow slender rostrum, and has bullæ like *pinetis* or *holzneri* and broad, heavy supraorbitals, with a broad, heavy triangular postorbital process touching the skull posteriorly and inclosing a well-marked oval foramen. The general resemblance of this specimen places it nearest to *cognatus*, of which it appears to be a slightly varying local form, such as is probably found on each isolated mountain within the range of this species.

The badly worn summer specimen from 35 miles north of Santa Rosa, New Mexico, is referred to *cognatus* with some hesitation. It has long ears like the present form, but the fresh pelage on the top of the head is much too dark. The skull is somewhat intermediate in character with *pinetis*, with which the bullæ agree in size, though the upperpart of the skull is more like that of *cognatus*. The occurrence of specimens of *cognatus* from different localities, with varying characters not uncommonly indicating more or less of an approach to *pinetis*, combined with the resemblance between *holzneri* and *pinetis*, leads to the suspicion that when abundant material, covering all the intermediate country, is at hand it may be found that there is distinct intergradation. In this case, the chain would be complete connecting the forms of *floridanus* with those of *S. nuttalli*; and as *nuttalli* has many years priority, it would necessarily replace *floridanus* as the name for the enlarged group.

Total number of specimens examined 8, from:

New Mexico: Capitan Mountains, 1; Datil Mountains, 1; Manzano Mountains, 5; Santa Rosa, 1.

SYLVILAGUS ROBUSTUS (BAILEY).

DAVIS MOUNTAINS COTTONTAIL.

Lepus pinetis robustus Bailey, N. A. Fauna No. 25, p. 159, October 24, 1905. Type from 6,000 feet altitude in Davis Mountains, Texas; No. $\frac{18242}{25163}$, ♀ ad., U. S. National Museum (Biological Survey collection); collected by Vernon Bailey, January 6, 1890.

Geographic distribution.—Davis, Chinati, and Chisos mountains in southwestern Texas. Vertical range mainly above 6,000 feet in Davis Mountains; zonal range mainly Transition.

General characters.—A large pale slightly buffy gray species, much larger and averaging a little grayer than *holzneri;* similar to *cognatus* in color, with rump patch iron gray; feet large, thickly furred, whitish; legs light rusty or rusty cinnamon; ears rather large, gray. Skull in general shape much like that of *holzneri* and much larger than in *cognatus*, with supraorbitals broader and more winglike and bullæ conspicuously larger.

Color in fresh winter pelage.—Top of head and back pale dull buffy, thinly washed with black; rump iron gray, forming a well-marked patch; sides of head and body dull, slightly buffy, gray; nape bright, light, rusty rufous; top of tail dull brownish, washed with gray; outside of ears pale buffy gray, paler than top of back and with only slight indications of dusky border on terminal half; front and sides of fore legs light rusty rufous, shading into whitish or buffy white on tops of fore feet; back and sides of lower hind legs a little darker and more cinnamon rufous than fore legs and shading into pale rusty buffy on sides of feet; underside of neck pale buffy gray varying to nearly drab with a gray wash, or to dull buffy brownish washed with pale buff or buffy gray; sides of neck underlaid with dull rusty buff, or rusty buffy brownish washed with gray, or pale grayish buffy, thus forming an indistinct collar separating the gray on sides of head from gray area on sides of body.

Worn spring or summer pelage.—In worn and faded pelage the buffy suffusion on top of head and back is mainly lost, and the entire upperparts become nearly uniform dull, rather pale, iron gray, clearest on rump; owing to wearing off of pale tips to hairs on legs, the rusty areas appear much darker and richer than in fresh pelage, while for same reason the ears become darker gray.

Skull.—Largest among the related forms; large, long, and proportionately narrow; similar to *holzneri*, but larger, with much larger and heavier supraorbitals, proportionately smaller molar series, and larger bullæ; rostrum long and tapering slightly to a rather broad muzzle, much as in *S. f. mallurus*, but the upper outline much flatter and without the strong descending curve near tip; braincase similar to *mallurus* in size and form; supraorbitals practically the same in size and form, with a small inclosed slit-like foramen along inner side of postorbital; zygomatic arch similar, but molar series proportionately smaller; bullæ much larger; basioccipital more deeply constricted posteriorly.

Average measurements (*5 adults*).—Total length, 456; tail vertebræ, 61.8; hind foot, 103; ear from notch in dried skin, 68.3.

Remarks.—The pale gray rabbits of the Transition and Canadian zones on the mountain tops of the southwest appear to be closely related, and two of them, *S. robustus* and *S. cognatus*, are not distinguishable by color, although they are separable by size and skull characters; while another (*holzneri*) is very close in general color. *S. robustus* is the largest and most isolated of the species of this group, and may be readily distinguished by its large size and long ears with the accompanying large, heavy skull, broad supraorbitals, small molar series, and large bullæ. Two of the five specimens of *robustus* examined are smaller than the others, and as both are males and the three distinctly large specimens are females, it appears as though the ordinary sexual difference among rabbits may be more strongly marked in this form than usual. It is quite probable that when material is available from the Sacramento and other high mountains of southern New Mexico, the intergradation of *holzneri* and *robustus* may be proved, but at present it appears best to treat them as distinct. Winter specimens are heavily furred, and the feet are large and woolly.

The abundant signs of a large cottontail on the tops of the higher mountains in Coahuila and adjoining parts of northeastern Mexico indicate the presence of a close relative of *robustus*. These signs were especially numerous in the Guadalupe Range west of Saltillo. Persistent hunting failed to secure one of the rabbits on this range, and no doubt an undescribed species or subspecies remains to be collected in the mountains of that region.

In winter these cottontails sometimes descend to much lower altitudes than their summer home and may be found at such times within the higher parts of the ranges of *S. a. minor* or *S. a. cedrophilus.*

Total number of specimens examined 5, from:

Texas: Chisos Mountains, 1; Davis Mountains, 1; Fort Davis, 2; Marfa (35 miles south), 1.

SYLVILAGUS TRANSITIONALIS (BANGS).

NEW ENGLAND COTTONTAIL.

(Pl. IX, fig. 1.)

Lepus sylvaticus transitionalis Bangs, Proc. Boston Soc. Nat. Hist., XXVI, pp. 405–407 (1894), January 31, 1895. Type from Liberty Hill, Connecticut; ♂ ad., Museum of Comparative Zoology (No. 2407, Bangs collection); collected by O. Bangs, November 6, 1894.

Geographic distribution.—New England States north to Rutland, Vermont, southern New Hampshire, extreme southwestern Maine, and southwest through eastern New York (including southern end of Lake George and Long Island), New Jersey, eastern Pennsylvania, and Maryland to Alexandria, Virginia; also along the Alleghenies through West Virginia to Roan Mountain, North Carolina, and Brasstown Bald Mountain in extreme northern Georgia (see fig. 12). Vertical range from near sea level in Virginia to 6,000 feet on Roan Mountain, North Carolina; zonal range mainly Transition and thence down into upper part of Upper Austral Zone.

General characters.—Size rather small, about equaling the Florida cottontail; nearest *mallurus* in general color, but differs from all other cottontails in the almost uniform rich pinkish buffy, varying to almost ochraceous buffy, of the upperparts; back overlaid by a distinct black wash, the latter strongly marked and giving a finely streaked or penciled effect on the buffy ground color in place of the usual grizzling seen in *mallurus;* rump patch obsolete; ears short, rounded, and broadly margined on inside with deep fulvous or ochraceous buffy; bullæ very small; supraorbital process decreasing in width anteriorly and ending in a point against skull with no anterior process or notch; posterior process tapering throughout its length to a slender and usually divergent point.

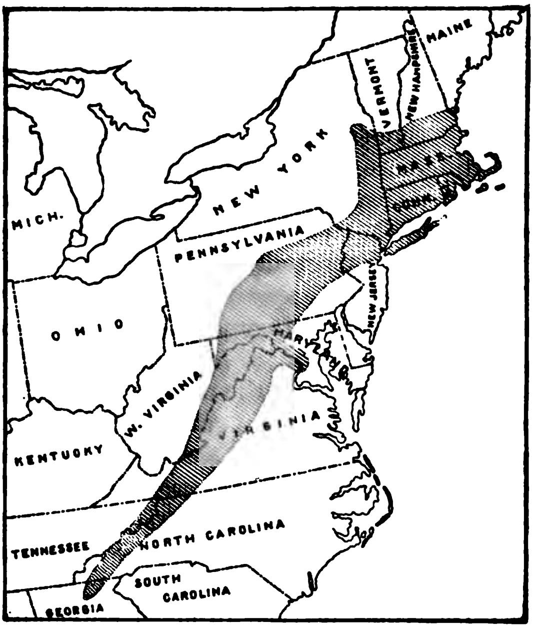

FIG. 12.—Distribution of the New England cottontail (*Sylvilagus transitionalis*).

Color in fresh pelage.—Upperparts of head and body usually bright pinkish buffy, varying to a deeper almost ochraceous buffy heavily overlaid with a black wash, the latter coarsely distributed and giving the effect of black streakings or pencilings; top of head with a narrow black patch between ears; sides of body less heavily washed with black than back and slightly paler pinkish buffy, often with a grayish wash; rump slightly duller buffy than back, but only indistinct traces of a paler rump patch; nape rusty rufous varying in intensity; top of tail rusty buffy brown; orbital area more or less strongly ochraceous buffy; rest of sides of head pale, slightly buffy, grayish; outside of ears dull ochraceous or slightly reddish buffy, washed and strongly margined with blackish; inside of ears with long whitish hairs on anterior border near base and elsewhere broadly margined with deep ochraceous, almost rusty, buffy; fore legs bright rusty rufous shading into paler, more ochraceous buffy on tops of fore feet; back and outside of lower hind legs and adjoining parts of outside of hind feet bright rufous, varying from a rich, almost bright, chestnut rufous to a light bright rusty, almost orange, rufous; tops of hind feet vary from bright whitish to pale buffy whitish; underside of neck varies from deep pinkish buff to a paler shade of same, and agrees closely with the clear deep pinkish buff along lower border of flanks.

Worn pelage.—The rich buffy of the head and body fades to a much paler shade, and the rufous on legs becomes paler.

Postjuvenal pelage.—Much like that of old adults, but the upperparts uniformly much darker and more of an ochraceous or deep pinkish buffy brown with a lighter wash of black, and even less traces of a pale rump patch than in the adults; front and hind legs more of a dull rusty cinnamon rufous; hind feet dull ochraceous buffy, varying to rusty buffy and buffy whitish.

Skull.—Light and slender, and much like that of *S. floridanus chapmani* in its small rounded braincase and narrowly pointed rostrum; upper outline of rostrum decurved anteriorly; interorbital breadth very narrow, narrower than in any other cottontail of the eastern United States; supraorbital process narrows conspicuously along outer side anteriorly, thus resulting in the absence of the anterior process of supraorbital and rendering anterior notch obsolete or reducing it to a shallow concave depression; the narrow posterior process stands well out from skull and tapers to a slender point slightly or not at all touching skull at tip and inclosing a well-marked oval notch or foramen; zygomatic arch light; jugal very slender and not strongly grooved; bullæ very small, smooth, and rounded; smaller than in any form of *floridanus* in the United States.

Average measurements (5 adults).—Total length, 388; tail vertebræ, 39; hind foot, 95; ear from notch in dried skin, 51.6.

Remarks.—This is a well-marked species, characterized by peculiarities of pelage, by small ears, and above all by the strikingly peculiar form of the supraorbital process, which narrows anteriorly in a way not seen in any other species of American rabbit except *Lepus washingtoni* and, to an even more marked degree, in *Romerolagus.* The slender tapering form of the posterior process of the supraorbital closely resembles that in *S. nuttalli* and related species of the Rocky Mountains, and is quite distinct from any form of *floridanus.* The range of *transitionalis* overlaps that of *S. floridanus mallurus* over a broad area between the Hudson River and Roan Mountain, North Carolina, without, so far as I have been able to determine, the slightest sign of intergradation. *S. transitionalis* varies but little throughout its range, and specimens from West Virginia are indistinguishable from those taken in Massachusetts. The small amount of variation noted in the considerable series examined from throughout the range is due mainly to the varying intensity of the buffy on the body and the richness of the bright rufous area on the hind legs. The dark-colored young adults in their postjuvenal pelage are more like *S. f. mallurus* than like old adults of *transitionalis*. The largest specimens with the heaviest skulls examined are from Alexandria, Virginia, and Travelers Repose, West Virginia, but otherwise these are perfectly typical.

During the summer of 1908 Mr. A. H. Howell extended the known range of this species to the extreme southern point of the Transition Zone of the Alleghenies on Brasstown Bald Mountain, in northern Georgia. The slight amount of geographic variation in this species is remarkable. Two specimens taken early in December at Young Harris, Georgia, at the base of Brasstown Bald Mountain, are in no way distinguishable in color from winter specimens taken in Massachusetts; and the skulls from Roan Mountain, North Carolina, and Brasstown Bald, Georgia, are similar to those from Massachusetts. This species, as in the case of some forms of *floridanus*, is extending its range. Dr. A. K. Fisher has noted their northward extension from the Hudson River Valley in New York. He saw the first individual at Lake George on October 18, 1884, but it had been known for some years as a resident species 12 miles farther south. The fall of 1907 he found them very abundant about Lake George and still slowly spreading northward. The fall of 1908 Mr. G. H. Ross, of Rutland, Vermont, writes that in 1889 cottontails were rare in that district and ranged below 1,500 feet altitude. Since then they have increased in numbers until they have become plentiful and in places entirely replace the formerly abundant varying hare. They now range up to 2,000 feet. In notes accompanying the original description, Bangs records their recent extension of range in New Hampshire. Mr. E. A. Preble, who for years has been familiar with this cottontail in Massachusetts, tells me that it is a much more strictly forest-inhabiting species than *floridanus*, as has already been recorded by Bangs.

Total number of specimens examined 83, from:

Vermont: Near Claremont, N. H., 1.
New Hampshire: Charlestown, 1.
Massachusetts: Easthampton, 2; Marthas Vineyard, 5; Middleboro, 1; Wilmington, 13.
Connecticut: Sharon, 2.
Rhode Island: Exeter, 9; Lake Worden, 8.

New York: Montauk Point, 1; Shelter Island, 2; Sing Sing, 3; Hastings, 1; Catskill Mountains, 2; Lake George, 8; Miller Place (Long Island), 1.
Pennsylvania: Stroudsburg, 1; Renovo, 1; Round Island, 5; Summit Mills, 3.
Virginia: Alexandria, 1.
District of Columbia: Washingon, 1.
West Virginia: White Sulphur Springs, 4; Travelers Repose, 2.
North Carolina: Roan Mountain, 2.
Georgia: Brasstown Bald Mountain, 1; Young Harris, 2.

SYLVILAGUS NUTTALLI Group (Subgenus SYLVILAGUS).

ROCKY MOUNTAIN COTTONTAILS.

The *S. nuttalli* group is made up of three not strongly marked subspecies belonging mainly to the Rocky Mountain and Great Basin regions of the western United States (see fig. 13). They belong mainly to the Transition and upper half of the Upper Sonoran Zone. The group consists of *S. nuttalli*, *S. n. grangeri*, and *S. n. pinetis*. Typical *nuttalli* has the most restricted range of the three forms and is confined mainly to the sagebrush area of the plains of the Columbia in Washington and Oregon. In western Idaho and northwestern Nevada it grades into the paler and slightly larger *grangeri*.

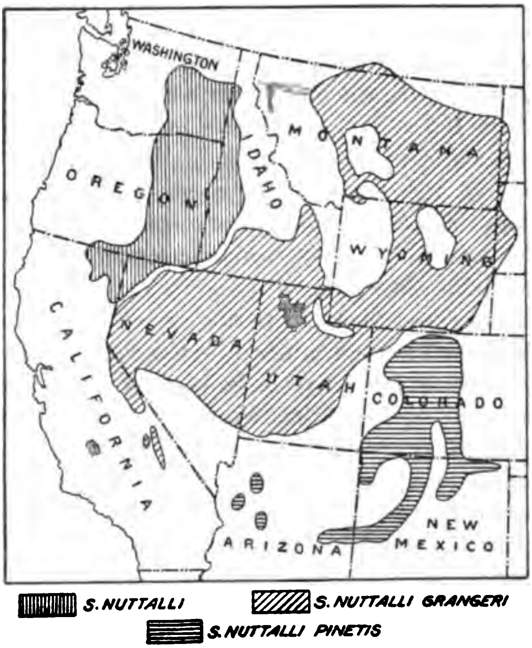

FIG. 13.—Distribution of the mountain cottontails of the *Sylvilagus nuttalli* group.

Throughout a large part of its range *grangeri* occupies sagebrush plains, mainly in the Transition Zone, but in Utah and Nevada, as the plains become lower and hotter, it continues to occupy the Transition Zone, and thus becomes a mountain species. Throughout its range *pinetis* belongs to the Transition Zone and is characteristic of the mountains. In the Rocky Mountains, from the Black Hills of South Dakota to middle New Mexico and Arizona, *grangeri* and *pinetis* frequent pine forests, lower border of fir forests, and aspen slopes. They have thick, heavy pelage and heavily furred feet, suitable to the cool climate in which they live. In many places in summer *pinetis* reaches an altitude of over 10,000 feet. In winter it frequently descends to the foothills and intrudes on the ranges of the local forms of *auduboni.* In the mountains of southern New Mexico and Arizona *pinetis* is replaced in the same life zones by members of the *floridanus* group of cottontails.

Just what relationship exists on the sage plains of Wyoming and adjacent areas between the distribution of *S. n. grangeri* and *S. auduboni baileyi* has not been determined. As a rule, however, where the representatives of *nuttalli* occupy the mountains they are replaced on the surrounding plains by representatives of the *auduboni* group. In such cases the *nuttalli* and *auduboni* groups have the same relative distribution as exists farther south between the members of the *floridanus* and *auduboni* groups. An apparently trivial but significant resemblance between the *floridanus* and *nuttalli* groups appears in their compactly rounded bullæ with polished surfaces, contrasting with the more inflated, irregularly rounded, and dull surface of the bullæ in the *auduboni* group. The small light skull of typical *nuttalli*, with its small supraorbital processes and free, diverging tips of the postorbital processes is very unlike the skulls of most members of the *floridanus* group, but the bridge between the two appears to be very nearly complete. In fact the collections now available show that the *Sylvilagus nuttalli* and *S. floridanus* groups are so closely related that there can be little doubt of their common origin. The relationship between *Sylvilagus floridanus holzneri* and *S. nuttalli pinetis* in Arizona is so extremely close that I have hesitated to separate the two groups. A series of *holzneri* and *pinetis* from all parts of their ranges in Arizona may yet demonstrate their complete intergradation. In this event all the subspecies now referred to *floridanus* must necessarily be treated as subspecies of *nuttalli*, since this last name has priority. The probability of the *nuttalli* and *floridanus* groups being one is increased by the fact that the ranges of the two are strictly complementary. Collections should be made between the ranges of *S. f. similis* and *S. n. pinetis* in Colorado to determine the relationship of the two groups at one of their points of contact where the resemblance is close.

Average measurements of the Sylvilagus nuttalli group.

		Skin.				Skull.							
	No. of specimens averaged.	Total length.	Tail vertebræ.	Hind foot.	Ear from notch, in dried skin.	Basilar length.	Length of nasals.	Breadth of rostrum above premolars.	Depth of rostrum in front of premolars.	Interorbital breadth.	Parietal breadth.	Diameter of bullæ.	Origin of specimens averaged.
Sylvilagus nuttalli	5	352	44.0	89.8	55.7	47.3	27.9	15.2	12.1	15.3	25.6	10.9	Washington.
Sylvilagus nuttalli grangeri.	5	385	46.0	95.4	55.8	51.1	29.9	16.5	13.6	16.5	26.2	11.5	Wyoming.
Sylvilagus nuttalli pinetis.	5	386	59.6	94.0	61.5	52.0	31.1	18.4	13.3	17.2	26.4	11.1	Prescott and Hualpai Mountains, Arizona.

SYLVILAGUS NUTTALLI (BACHMAN).

WASHINGTON COTTONTAIL.

(Pl. X, figs. 3, 5.)

Lepus nuttallii Bachman, Journ. Acad. Nat. Sci. Philadelphia, VII, pt. 2, pp. 345–348, Pl. XXII, fig. 1, 1837. Type probably from eastern Oregon, near mouth of Malheur River; No. 382, Academy of Natural Sciences, Philadelphia; collected by Thomas Nuttall, August, 1834.

Lepus artemisia Bachman, Journ. Acad. Nat. Sci. Philadelphia, VIII, pt. 1, p. 94, 1839. Type from Old Fort Walla Walla, Washington; formerly in Academy of Natural Sciences (apparently no longer extant); collected by J. K. Townsend.

Geographic distribution.—Plains and lower mountain slopes of Columbia River basin in eastern Washington and Oregon; also northeastern California, northwestern Nevada, and western Idaho. Vertical range from about 100 feet on Columbia River to about 3,000 feet altitude near Prineville, Oregon; zonal range mainly Upper Sonoran and lower part of Transition Zone.

General characters.—Size rather small; smallest of the subspecies; ears short, broadly rounded, and coarsely haired; color of upperparts dark fulvous buffy brown, sometimes dusky fawn color, sides a little lighter or grayer; rump more dusky gray; skull light, with rostrum narrow; postorbitals slender and rodlike; bullæ medium sized, smaller than in the other forms.

Color in fresh pelage.—Top of head plain dull buffy fawn color; top of back varying from dull dark buffy, tinged with fawn color, to dull dark fawn color, darkened by a wash of black; sides of head and body slightly paler and grayer; rump dark iron gray, forming a not strongly contrasting rump patch; nape dark rusty rufous; ears dark gray, edged with black along most of front border and about tip; inside of ears dingy gray; top of tail dusky brown, grizzled with dull gray and dingy buffy; front and sides of fore legs light rusty rufous, becoming much paler and more buffy on tops of fore feet; back and sides of lower part of hind legs varying from rather dark rusty cinnamon to a pale rusty cinnamon, shading into pale dull rusty along outside of hind feet; tops of hind feet white, sometimes tinged with underlying dull rusty; underside of neck varies from dark, slightly ochraceous, buffy to dark dull buffy with a strong tinge of fawn color; middle of breast and abdomen usually nearly or quite pure white to base of hairs and underfur, thus forming a pure white area surrounded by an area with underfur slate color at base, this color showing through thin surface layer of white, giving a bluish gray tinge.

Worn pelage.—The pelage fades in spring and summer to a much paler or grayer buffy, and finally wears away until the upperparts become more or less darkened by the exposure of the underlying dusky brown or dark brownish buffy underfur.

Postjuvenal pelage.—Upperparts dull, finely grizzled, grayish buffy, much paler than old adults and with more of a creamy shade to the buffy; rump patch dusky grayish, much more indistinct than in adults; top of tail dusky brown, grizzled with buffy gray; nape and fore legs duller rusty rufous than in adults; hind legs rusty cinnamon, varying in intensity and paler rusty on sides of feet, which sometimes become buffy on top; underside of neck and white area on middle of underparts much as in adults.

Juvenal pelage.—Upperparts dusky grizzled gray, slightly paler on sides of body and rump; nape dull dingy rusty; ears dark dull gray, more strongly bordered with black than adults; fore legs and feet pale dull rusty buffy; hind legs and feet paler than in adults, with a slightly more cinnamon shade of buffy, palest on tops of feet; underside of neck and body about as in adults.

Skull.—Small and light, in general form much like that of *S. a. parvulus;* proportionately short and broad across base, with slender rostrum and long narrow slightly tapering nasals; braincase broader and more rounded than in either *S. auduboni arizonæ* or *S. floridanus*, and with a distinct rounded bulging on middle of parietal area on each side crossed by suture along upper border of squamosal; this character distinctive and gives braincase its exceptionally full rounded appearance; supraorbitals attached to skull much as in *L. bachmani* by a narrow base with the anterior process separated from skull by a deep, narrow, incised notch; posterior process slender, tapering, standing out broadly from skull, except at posterior tip, where usually nearly or quite touching skull, and thus inclosing a large, well-marked, flattened oval foramen; upper border of premaxillaries forming a strong beadlike angle on each side of rostrum, bordering nasals; molar series proportionately heavier than in either *arizonæ* or *bachmani;* bullæ proportionately rather large, about midway in size between the very small ones of *bachmani* and the very large size of *arizonæ*, but compactly rounded with polished surface as in the *floridanus* group.

Average measurments (*5 adults*).—Total length, 352; tail vertebræ, 44; hind foot, 89.8; ear from notch in dried skin, 55.7.

Remarks.—The name *Lepus nuttalli* for many years drifted about and was applied in turn to several species of cottontails, but has at last been fixed where it belongs, on the species living in eastern Oregon and the adjacent area. The type specimen still exists in the Academy of Natural Sciences of Philadelphia, and is very young, scarcely one-fourth grown.

In the original description the type locality was not stated, but the species was said to frequent the borders of small tributaries of the Shoshone and Columbia rivers. More definite information is found in the appendix to Townsend's Narrative, page 314, where he says: "This description [of the type of *Lepus nuttalli*] is from a single specimen brought by Mr. Nuttall from beyond the Rocky Mountains. It was captured on the banks of a small stream which flowed into the Snake or Shoshone River, where it was not uncommon. We never heard of it on the Columbia, and presume, therefore, that it does not inhabit a very extended range." From a close reading of Townsend's Narrative it appears probable that the type of *nuttalli* came from a small tributary of the Snake River in eastern Oregon not far from the mouth of Malheur River.

Oregon specimens represent typical *nuttalli*, and are the smallest, with the smallest and most delicately formed skulls, of any of the subspecies. To the southward, in northeastern California, representatives of this form become a little larger and a little darker colored than typical specimens. A skull from Cheney, Washington, is larger and heavier than usual; and the bullæ are much larger than in any other specimen examined, and even exceed the size of the bullæ in typical *grangeri*. To the east and south, in Idaho and Nevada, they become paler and increase in size, thus grading into the larger and paler *grangeri*. The darker colors and smaller size of *nuttalli*, contrasting with the paler colors and larger size of *grangeri*, are the only tangible characters separating these two forms. It is interesting to note that typical *S. nuttalli* has a distribution nearly coincident with that of *Lepus californicus wallawalla*.

Total number of specimens examined 68, from:

Washington: Asotin, 1; Cheney, 1; Douglas, 1; Fort Spokane, 2; Pullman, 1; Rattlesnake Hills (30 miles east of Yakima), 1; Rock Lake, 2; Rockland, 1; Soap Lake, 1; Spokane Bridge, 4; Touchet, 5.

Oregon: Burns, 1; Crooked River (20 miles south of Prineville), 2; Des Chutes Valley, 1; Heppner, 1; Lake Alvord, 1; Plush, 1; Prineville, 2; Shirk, 1; Steen Mountain, 1; The Dalles, 4; Twelve-Mile Creek, 3.

California: Beswick, 2; Bieber, 1; Bridgeport, 1; Brownell, 1; Burney, 1; Cassel, 1; Hayden Hill, 1; Honey Lake, 1; Mayten, 1; Millford, 1; Mono Lake, 1; Pitt River (North Fork), 1; Petes Valley, 1; Shasta Valley, 2; Susanville, 2.

Idaho: Fiddle Creek, 6; Lewiston, 1; Sawtooth National Forest, 2.

Nevada: Anderson Ranch, 2; Summit Lake, 1.

SYLVILAGUS NUTTALLI GRANGERI (ALLEN).

BLACK HILLS COTTONTAIL.

Lepus sylvaticus grangeri Allen, Bull. Am. Mus. Nat. Hist., VII, pp. 264–265 (author's separates issued August 21, 1895). Type from Hill City, South Dakota; No. $\frac{8084}{7702}$, ♂ ad., American Museum of Natural History; collected by W. W. Granger, August 11, 1894.

Lepus l[aticinctus] perplicatus Elliot, Field Columbian Museum, Chicago, Zool. series, III, No. 14, pp. 255–256, December, 1903. Type from Hannopec Canyon, Panamint Mountains, California; No. 12612, ♀ ad., Field Museum of Natural History, Chicago; collected by E. Heller, May 12, 1903.

Geographic distribution.—Western South Dakota, most of Montana and Wyoming; most of the sagebrush plains of Idaho (except extreme western and northwestern parts), Nevada (except northwestern corner and low valleys in the south); mountains of middle eastern California from near Mono Lake to Panamint Range; most of Utah, and northwestern Colorado; extends north of the United States into southern Alberta and Saskatchewan, Canada. Zonal range mainly Transition and upper half of Upper Sonoran Zone.

General characters.—Upperparts pale buffy gray much like *pinetis* but paler, with rufous on legs brighter or more intense; size the same; ears shorter; skull narrower; rostrum shorter; interorbital breadth narrower; bullæ larger. The pale colors of *grangeri* give it a superficial resemblance to *S. a. baileyi*, but the shorter more hairy ears at once distinguish it.

Color in fresh pelage.—Top of head creamy buff with a slight shade of fawn color, lightly frosted on surface with gray; top of back a slightly paler shade of same creamy buff, darkened by an overlying wash of black; rump patch iron gray; top of tail dull buffy brownish; underside white; sides of head and body dull buffy gray, much paler and grayer than back; nape light rusty rufous; front and sides of fore legs bright, almost orange, rufous, varying to a slightly darker and more cinnamon rufous, but like hind legs averaging much brighter rufous than in *pinetis*, and shading into a paler, more rusty buffy on tops of fore feet; back and outside of lower hind legs similar to front of fore legs, but rufous deeper and richer; outside of hind feet more or less strongly shaded with rusty; tops of hind feet white, underlaid with a tinge of rusty buffy; underside of neck dull creamy buffy, varying to a dull ochraceous buffy, with a wash of grayish on surface; rest of underparts pure white; sides of neck rather dull grayish creamy buff underlaid and tinged with a dull reddish brown; ears dull grayish, edged about terminal third with black.

Worn pelage.—Upperparts bleached to grayish white, underlaid by varying shades of the buffy brown underfur, which often give badly worn specimens a much darker or browner appearance, very different from freshly pelaged ones; legs average brighter rufous; outside of ears duller and browner; nape deeper and richer rusty; rump patch less distinct.

Postjuvenal pelage.—Darker and more grizzled grayish buffy than adults, with rump patch much less distinct; sides of body only slightly grayer than back; legs bright rufous, as in adults.

Juvenal pelage.—Dark dull grayish buffy; rather darker than in the young of *pinetis;* nape and legs duller and paler rusty, often becoming rusty buffy on legs and feet.

Skull.—Similar to that of *pinetis* but averaging smaller, slenderer, and less heavily proportioned; rostrum narrower at base and braincase about the same width; molar series heavy as in *pinetis;* bullæ of Wyoming specimens smaller than in typical examples; in Idaho and Montana bullæ average smaller and about equal those of typical *nuttalli;* postorbital process touching skull at extreme posterior end and inclosing a flattened oval foramen.

Average measurements (5 adults).—Total length, 385; tail vertebræ, 46; hind foot, 95.4; ear from notch in dried skin, 55.8.

Remarks.—The type of *grangeri* from the Black Hills of South Dakota is a nearly grown young in the grizzled, dark buffy grayish postjuvenal pelage. Among five topotypes examined, only one is fully adult, and it is in extremely worn, ragged condition, with the new pelage just starting in places; the others are all younger than the type. For this reason it is impossible to say just what the fresh pelage of the adult from the Black Hills is like, but the traces of it in the single adult indicate that it is similar to but perhaps a little darker than various specimens in good condition from the surrounding region. The skulls of the type and topotypes of *grangeri* are characterized by a proportionately greater breadth of braincase than the average from the surrounding region, although these last are noticeably broader than in average *nuttalli.*

The type of *grangeri* has an unusually broad braincase, rounded on the sides, and larger bullæ than a much more adult topotype; the skulls of nearly grown specimens of *grangeri* are characterized by the great proportionate fullness of the braincase, which is less marked in more adult condition, when the rostrum becomes more fully developed. The series from Montana and Idaho have broader and heavier molars than those from Wyoming. Several young adults from North Dakota and Montana have the rufous on hind legs and feet very bright and strongly marked, even along outsides of feet. The bright rich rufous on the hind legs in a series of typical *grangeri* stands out strikingly when compared with an equal number of typical *nuttalli* and *pinetis*.

The type of *grangeri*, as already stated, is a nearly grown young of the year in postjuvenal pelage. It is of about the same age and in about the same condition of pelage as the type of *pinetis*, from which it differs in the lighter, or slightly grayer, color of the upperparts, the paler rusty on the legs, and shorter ears. The only adult topotypes of these two forms are both in badly worn and faded pelage, but the paler colors of *grangeri* are apparent. *S. n. grangeri* grades into *pinetis* near the southern border of Wyoming and into *nuttalli* somewhere in western Idaho and northwestern Nevada. The exact delimitation of the ranges of *S. nuttalli* and its subspecies still remain to be worked out. To the north *grangeri* ranges across the Canadian border to the Cypress Hills, Saskatchewan, and no doubt into the adjacent part of Alberta.

One specimen in the Biological Survey collection (No. 139098) from Lay, Colorado, is indistinguishable in external characters from three specimens of *S. a. baileyi* from the same place, but its skull is that of *grangeri*, to which it has been referred. Several other specimens of cottontails, some *baileyi*, and some *grangeri* from northwestern Colorado are extremely puzzling, and much more material from there and elsewhere in this State is needed before the relationships and ranges of the several cottontails can be satisfactorily determined.

Specimens from southwestern Nevada and adjacent part of California have slightly longer ears and average smaller and lighter skulls than typical *grangeri*, but these differences are within those ordinarily seen between extremes of the same form. Specimens representing this variation in ears and skull collected in the Panamint Mountains on the eastern border of California were described as *Lepus laticinctus perplicatus* Elliot, but with the Elliot specimens and considerable additional material for comparison, I am unable to find sufficiently definite characters to warrant recognition of this form. Winter specimens from Nevada and the border of southeastern California are indistinguishable in color from others taken at the same season in Montana. A specimen in the Merriam collection (No. 5434) from Ogden, Utah, has a remarkably slender skull, the braincase being extremely narrow and resembling that of *S. a. arizonæ*, but the rostrum, supraorbitals, and bullæ are of the *grangeri* type, as are the external characters, including the ears. A skull from Upper Kanab, Utah, also is very narrow. An immature specimen from Helper, Utah, is darker and approaches *pinetis*. The small series examined from the Coso Mountains, California, have the longest ears of all, and in this character resemble those from the

Hualpai Mountains, Arizona. Two specimens from Mount Ellen, Utah, have short ears and dark color approaching *pinetis*, but the skulls are shorter and proportionately broader and the bullæ larger, as in *grangeri*, to which they have been referred.

Total number of specimens examined 120, from:

North Dakota: Fort Buford, 4.

South Dakota: Custer, 3; Elk Mountains, 1; Hill City, 6; Spring Creek, 1.

Montana: Bowers, 1; Bozeman, 1; Eagle Creek, 1; Fort Custer, 6; Frenchmans River, 1; Gallatin County, 1; Gardiner, 12; Great Falls, 1; Little Dry Creek, 1; Robare, 2; Sunday Creek, 1.

Idaho: Big Lost River, 1; Blackfoot, 1; Lemhi, 3; Lemhi Valley, 2; Lost River Mountains, 1.

Wyoming: Bridger Pass, 3; Deer Creek, 1; Devils Tower, 3; Fort Bridger, 3; Green River, 2; Laramie Mountains, 1; North Platte, 1; Rock Creek, 3; Sherman, 1; Sundance, 1; Wind River Basin, 1; Woods post-office, 1.

Colorado: Douglas Spring (Routt County), 1; Escalante Hills, 2; Lay, 2; Meeker (Rio Blanco County), 1.

Utah: Bear Lake, 1; Henry Mountains (Mount Ellen), 2; Helper, 1; Hot Springs (12 miles north of Ogden), 2; Laketown, 1; Nephi, 1; Ogden, 3; Panguitch, 1; Upper Kanab, 1.

Nevada: Carson, 3; Gardnerville, 1; Monitor Valley, 1; Mountain City, 2; Paradise, 3; Paradise Valley, 2; Reese River Valley, 5; Truckee Meadows, 1.

California: Coso Mountains (Bryan Mine), 3; Panamint Mountains, 5; White Mountains, 1.

Saskatchewan: Cypress Hills, 1.

SYLVILAGUS NUTTALLI PINETIS (ALLEN).

ROCKY MOUNTAIN COTTONTAIL.

(Pl. X, fig. 2.)

Lepus sylvaticus pinetis Allen, Bull. Am. Mus. Nat. Hist., N. Y., VI, p. 348, December, 1894. Type from White Mountains, south of Mount Ord, Arizona; No. $\frac{8041}{7336}$, ♂ yg., American Museum of Natural History; collected by B. C. Condit, August 14, 1894.

Geographic distribution.—Pine forests of mountains from central Arizona and middle-western New Mexico, north through Colorado except northwestern corner. Vertical range in Colorado and New Mexico from about 7,500 to over 10,000 feet; zonal range mainly Transition and lower edge of Canadian, moving down in winter to border of Upper Sonoran Zone.

General characters.—Largest of the forms of *nuttalli*, with which latter it agrees most nearly in color; darker than *grangeri;* ears long; pelage long and abundant; feet large and furry; upperparts vary from dull creamy buff to pale dull grayish fawn color, always darkened with a wash of black, producing a generally dark buffy gray tone; rufous on legs as in *nuttalli* and dull gray rump patch not so strongly marked as in *grangeri*.

Color in fresh pelage.—Top of head varying from dark pinkish buffy to dull ochraceous buffy; top of back varying from creamy buff in palest specimens to a dull slightly ochraceous buffy or dark dull pinkish buffy, sometimes with a shade of dull fawn color; the general shade always darkened to a dark buffy gray by a thin overlying wash of black; rump patch dull iron gray not strongly marked; sides of head and body paler and more buffy gray than back; sides of neck similar to top of back but less washed with black; nape usually rich rusty rufous, washed with paler on tips of hairs; outside of ears vary from pale slightly buffy gray to darker more grayish buffy, usually edged about terminal third with black; top of tail dull brownish, grizzled with dull grayish or buffy gray; front and sides of fore legs rather light rusty rufous, shading into pale ochraceous buffy on tops of feet; back and outside of lower hind legs varying from dull rather dark cinnamon rufous to a paler more buffy cinnamon (not brightly rufous as in *grangeri*); a paler shade of same color extending over outside of hind feet; tops of hind feet white, sometimes more or less tinged or underlaid with buffy; underside of neck usually deep ochraceous buffy, becoming paler and more of a dull pinkish buffy in unusually pale specimens; lower border of flanks and sometimes inguinal area clear buffy; rest of underparts pure white.

Worn pelage.—Top of back first bleaches to pale, almost whitish, buffy gray and then wears down to the darker reddish or buffy brown of surface of underfur, while rufous on legs and nape becomes darker through wearing off pale tips to hairs; in this condition color of upperparts much darker and very different from color in fresh pelage or in bleached but unworn specimens.

Postjuvenal pelage.—Upperparts dark, grizzled grayish buffy, with ears and rump patch darker and less distinct than in adults.

Juvenal pelage.—Darker and more yellowish buffy with less grayish than in any of the other forms.

Skull.—Largest and heaviest among the forms of *nuttalli*, with supraorbitals broader and heavier; postorbital process usually rests against skull along inner border of terminal fourth; braincase broad, rounded and inflated, or slightly bulging, on sides of parietals; jugal nearly flat in middle and deeply grooved anteriorly, the groove ending in a shallow pit; molar series rather heavy; bullæ average about the same size as in *grangeri* but proportionately a little smaller; rostrum rather long and tapering to a narrow tip; upper outline nearly straight; frontal area depressed a little more than in the other forms of *nuttalli* and the winglike form of supraorbitals more strongly marked, due largely to their greater size.

Average measurements (*5 adults*).—Total length, 386; tail vertebræ, 59.6; hind foot, 94; ear from notch in dried skin, 61.5.

Remarks.—The type of *pinetis* is a nearly grown young of the year in its postjuvenal pelage, and the single adult topotype is in extremely worn and faded condition. Fortunately a specimen from the east side of the White Mountains near Springerville, Arizona, practically a topotype, is in fine fresh pelage, and agrees with a considerable series in good condition from the mountains of New Mexico and Colorado. These give a definite range to this little-known cottontail. Wherever found it appears to be restricted to the higher slopes of the mountains. The lower border of the range of *pinetis* (as in the other forms of *nuttalli*) meets the upper border of the range of various forms of *auduboni*. There appears to be little, if any, real overlapping of the ranges of members of these two groups, except perhaps in winter, when the heavy snows drive *pinetis* down to lower country than they usually frequent.

A series of *pinetis* from the Hualpai Mountains, Arizona, is in extremely worn summer pelage, and in this condition the specimens are similar to those from other parts of its range, but have distinctly longer ears. The skulls, however, can be closely matched by others from Colorado. Winter specimens from various parts of Colorado are closely like those from about Halls Peak, New Mexico. The darkest and most richly colored specimens examined are in the Warren collection, from Fort Lewis and Glenwood Springs, in western Colorado, while from central northern New Mexico and various parts of Colorado a number of winter specimens have a slight fawn-colored tinge on the back. These variations appear to be mainly individual, but perhaps are partly due to age. There is considerable individual as well as geographic variation among the skulls of *pinetis*. The molar series of the Arizona specimens available for comparison are smaller than those from Colorado. In many Colorado specimens the molars are considerably larger. The molars of the series from northern New Mexico also average larger than those from Arizona, but are not so large as some of those from Colorado. This appears to indicate a progressive increase in the size of the molars from Arizona to Colorado. The Arizona skulls also average a little smaller than those from farther north. The variation in the size of the bullæ is marked. In some cases this is purely individual, since specimens with large and small bullæ sometimes occur in the same locality, but there are also striking local differences, which are illustrated in several series of specimens from different places. These specimens lead me to suspect that they may represent a slight localized form, with small bullæ peculiar to the Canadian zones of the higher mountains. For example, three specimens in the Warren collection from near Lake Moraine, at over 10,000 feet altitude, have strikingly smaller bullæ than the specimens from lower altitudes in Colorado; while in a series of six specimens from Halls Peak, New Mexico, without any altitude given, the two largest skulls have bullæ of typical size, while four rather smaller and slenderer ones have proportionately much smaller and more rounded bullæ, just as in the Lake Moraine, Colorado, specimens. The color and other external characters of the series with large and small bullæ appear to be the same.

The skull of the adult topotype of *pinetis* lacks the small posterior molar on both sides, thus making the molar series much shorter than usual. This is the only specimen examined in which this tooth is lacking. The postorbital processes are slenderer than usual in this skull, inclosing an unusually wide foramen. The skulls from Hualpai Mountains, Arizona, and one from near Prescott have small molars. One of the Hualpai skulls has small rounded bullæ as in the four from Halls Peak and in one from Tres Piedras, New Mexico.

In many cases, particularly in somewhat worn pelage, the external appearance of specimens of *pinetis* is so much like that of specimens of *arizonæ*, or other neighboring forms of *auduboni* in the same condition, that they are very difficult to distinguish. The skull characters, especially the proportionately much smaller bullæ, usually readily distinguish *pinetis*.

Under *Sylvilagus cognatus* attention has been drawn to the apparently close relationship between *pinetis* and the two representatives of the *floridanus* group in New Mexico and Arizona—*holzneri* and *cognatus*. The *nuttalli* and *floridanus* groups again come in contact on the basal east slope of the Rocky Mountains near Denver, Colorado. There the ranges of *S. n. pinetis* and *S. f. similis* nearly or quite touch, and these two forms have a close superficial resemblance. Large series of specimens from the bordering parts of the ranges of these two groups are necessary to determine their actual relationship.

Total number of specimens examined 111, from:

Colorado: Arkins, 1; Boulder County, 1; Buffalo Creek Post-office, Jefferson County, 1; Conejos River, 2; Coulter, 1; Crawford, 4; Dead Lake Divide (El Paso County), 1; Estes Park, 6; Florissant, 1; Fortification Creek (near Craig), 2; Mount Baldy (near Fort Garland), 2; Fort Lewis, 1; Glenwood Spring, 8; Golden, 2; Gold Hill, 1; Greenhorn Mountains, 1; Hayden, 3; Hebron, 2; Lake Moraine, 3; Longs Peak, 1; Mancos, 3; Medano Pass, 1; Poncha Pass, 1; Rio Grande, 1; Sapinero, 1; Salida, 3; Santa Maria Lake, 1; Walcott, 2; near Yampa (Wright's ranch), 4.

New Mexico: Arroyo Hondo, 1; Catskill, 1; Chusca Mountains, 4; Copperton, 2; Costillo Pass, 3; Gallinas Mountains, 2; Halls Peak, 6; Jemez Mountains, 1; Martinez, 4; Raton Range (5 miles north of Folsom), 2; Road Canon (7 miles southwest of Catskill), 1; San Antonio Mountain, 1; Santa Clara Mountains, 1; Sierra Grande, 1; Taos Mountain, 1; Tierra Amarilla, 2; Tres Piedras, 2; Twining, 1; Vermejo Park, 1; Willis, 1.

Arizona: Hualpai Mountains, 5; Pine Springs, 1: Prescott, 1; Springerville, 1; White Mountains, 4.

SYLVILAGUS AUDUBONI Group (Subgenus SYLVILAGUS).

WESTERN COTTONTAILS.

Owing to lack of specimens from the type locality, the exact status and relationship of *Sylvilagus auduboni* have long been unsettled. Fortunately, the proper material is now available, and proves that *auduboni* belongs to the same species as the well-known *arizonæ*, which latter has hitherto typified a group of subspecies. Since *auduboni* has priority over *arizonæ*, the latter, with the subspecies commonly referred to it, must be treated as subspecies of *auduboni*. Abundant series from all parts of the range show that the most common and widely spread cottontails of the arid western plains and Pacific coast belt of the United States and middle and northwestern Mexico belong to a single species containing a group of twelve recognizable subspecies, of which *auduboni* was the first to be named. More in detail, the range of the *auduboni* group extends from San Francisco Bay to middle Texas, and from southern Montana to Cape St. Lucas and middle Sinaloa, western Mexico, and to the Plains of Puebla, near the southern end of the tableland in interior Mexico (see fig. 14). *S. auduboni* is about the size of the common cottontail of eastern United States, but most of the subspecies average smaller. There is sometimes a close resemblance in general color between some subspecies of *auduboni* and some subspecies of the eastern *floridanus* group. Representatives of the two groups may be readily distinguished, however, by marked skull characters, and usually by difference in length of the ears.

There is a broad belt along the eastern border of the range of this group, especially in Texas and on the tableland of Mexico, in which the ranges of the *auduboni* and *floridanus* groups overlap, but I have found no evidences of intergradation between the two. So far as I am aware, no form of *auduboni* reaches the east coast of the United States or Mexico, and no form of *floridanus* reaches the west coast north of the Isthmus of Tehuantepec in southern Mexico. It thus becomes evident that the *auduboni* group is characteristic of the west coast region and the *floridanus* group of the east coast, their ranges overlapping on the plains east of the Rocky Mountains and Sierra Madre.

Typical *auduboni* occupies the most humid area of any of the subspecies, and is the most deeply brownish in color.

Sagebrush plains and similar arid brushy open country, as well as the slopes of the desert mountains, with scattered growth of junipers and piñon pines, are favorite haunts of the western cottontails, which are often very abundant. The group has a vertical range from sea level in California and western Mexico up to about 8,500 feet on some of the mountain slopes of the interior of Mexico. Its zonal range is from the border of the Arid Tropical Zone in Sinaloa, Mexico, up through Lower and Upper Sonoran into the Transition Zone.

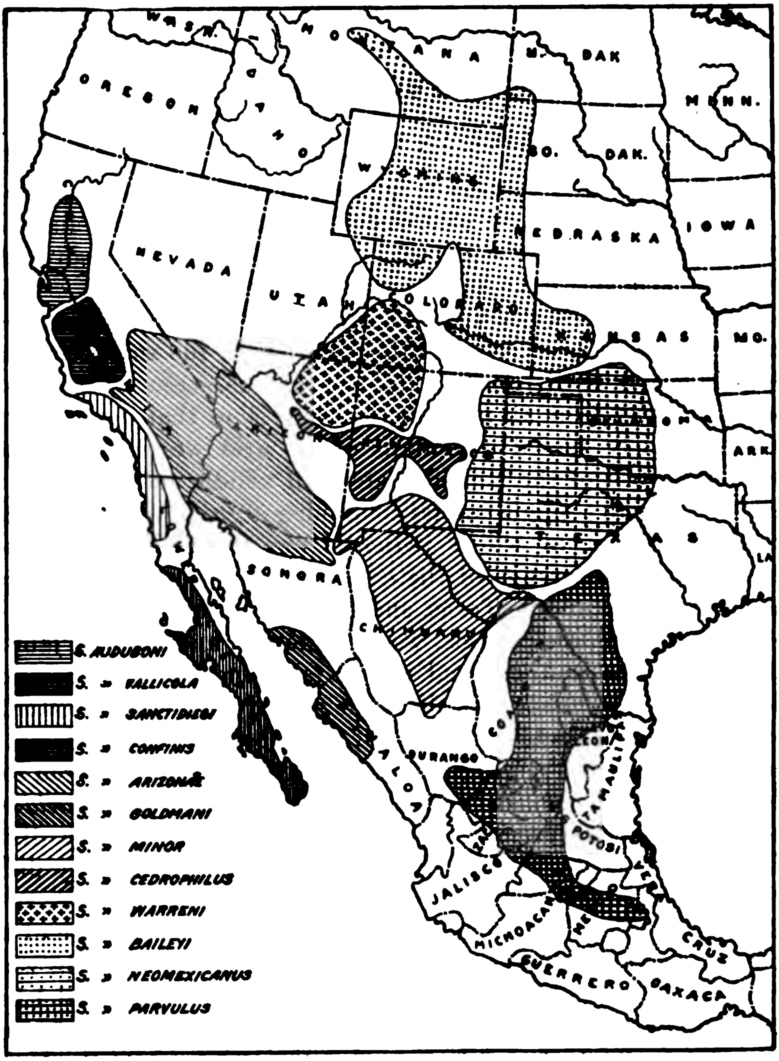

FIG. 14.—Distribution of the western cottontails of the *Sylvilagus auduboni* group.

The principal external character of these cottontails is their large ears, while the main skull character is the large, roughly rounded bullæ. In general the skull has a straight, narrow, and rather pointed rostrum, comparatively broad braincase, and broad and winglike supraorbital processes, which are usually elevated above the plane of the frontals. The posterior process of the supraorbital is nearly always broad, and the terminal end of the blunt posterior point touches the skull. The skull is light and pointed, and in general appearance resembles that of the smaller *S. bachmani.*

The variation in size among the subspecies is considerable, but the color differences are most marked. For instance, typical *S. auduboni*, *S. auduboni baileyi*, and *S. auduboni parvulus*, so far as color goes, are quite different looking animals.

On the western plains and the tableland of Mexico these cottontails commonly occupy deserted holes of prairie dogs, badgers, and other mammals, or live in holes and crevices under cliffs, among rocky ledges, or even under deserted ranch houses. They are not known to dig their own burrows, but they often enlarge old ones or partly excavate entrances under rocks and similar places. Where there are no burrows or natural cavities they make forms among dense vegetation.

Average measurements of the Sylvilagus auduboni group.

	No. of specimens averaged.	Skin.				Skull.							Origin of specimens averaged.
		Total length.	Tail vertebræ.	Hind foot.	Ear from notch in dried skin.	Basilar length.	Length of nasals.	Breadth of rostrum above premolars.	Depth of rostrum in front of premolars.	Interorbital breadth.	Parietal breadth.	Diameter of bullæ.	
Sylvilagus auduboni	5	418	72.6	86.0	59.8	54.0	30.3	17.8	14.2	19.1	26.4	11.5	Chico, Sacramento Valley, California.
Sylvilagus auduboni vallicola.	5	402	55.0	91.0	69.6	54.4	30.4	17.5	13.8	18.1	26.1	11.6	San Emigdio and Alila, California.
Sylvilagus auduboni sanctidiegi.	5	398	66.0	89.6	68.6	54.9	31.0	18.2	14.0	18.6	26.4	12.3	San Diego Co., California.
Sylvilagus auduboni confinis.	5	361	46.0	85.8	62.6	50.4	26.7	15.9	12.9	17.7	25.2	12.1	Near Playa Maria Bay, Lower California.
Sylvilagus auduboni arizonæ.	5	359	51.4	84.4	68.9	51.6	28.4	16.0	13.4	17.3	25.3	13.1	Kingman, Arizona.
Sylvilagus auduboni goldmani.	5	382	52.0	83.0	65.6	51.6	28.2	17.5	13.0	17.8	24.7	11.2	Sinaloa, Mexico.
Sylvilagus auduboni minor.	5	351	52.8	80.0	59.1	48.7	26.5	16.2	12.2	16.5	24.8	12.4	Near El Paso, Texas.
Sylvilagus auduboni cedrophilus.	5	375	46.0	89.6	60.7	50.7	28.5	17.1	13.0	17.0	25.1	12.4	South central New Mexico.
Sylvilagus auduboni warreni.	5	384	50.0	97.0	66.0	52.5	30.8	18.0	13.8	17.1	26.6	12.6	Southwest Colorado.
Sylvilagus auduboni baileyi.	5	411	57.0	96.4	64.3	52.9	30.4	18.3	13.9	17.6	26.7	12.3	Bighorn Basin and Lander, Wyoming.
Sylvilagus auduboni neomexicanus.	5	374	49.0	87.0	55.0	48.3	27.5	16.7	12.7	16.7	25.1	12.2	Pecos Valley, New Mexico.
Sylvilagus auduboni parvulus.	5	359	45.8	76.0	57.3	48.1	27.4	16.4	12.3	17.6	25.4	11.6	Southern end of Mexican Tableland.

SYLVILAGUS AUDUBONI (BAIRD).

SACRAMENTO VALLEY COTTONTAIL.

(Pl. XI, figs. 1, 5.)

Lepus auduboni Baird, Mam. N. Am., pp. 608–610, pl. 58, fig. 2, 1857. Type from San Francisco, California; No. $\frac{1128}{2045}$, U. S. National Museum; collected by Lieut. W. P. Trowbridge (type now lost).

Geographic distribution.—Interior of north-central California from Red Bluff in Sacramento Valley south in suitable localities in valley and foothills to north end of San Joaquin Valley (Chinese Camp on the east and Los Banos on the west), and reaching the coast along the east and south sides of San Francisco Bay, and thence south through the adjacent Santa Clara Valley. Vertical range from sea level at San Francisco Bay up to about 4.000 feet on west slope of Sierra Nevada; zonal range mainly semiarid Upper Sonoran.

General characters.—Size rather large (total length averaging over 400 mm.); upperparts, including head, in fresh pelage dark buffy brown; ears, compared with most other forms of this species, proportionately short, grayer than back and strongly bordered about tip on outside by black; tail large, brown above and fluffy white below.

Color in fresh winter pelage.—Upperparts, including top of head, dark ochraceous buffy brown, darkest and most heavily washed with black on top of back and shading on sides of head and body into slightly paler buff (sometimes with a grayish cast) with less overlying black; rump usually like rest of back but sometimes with slight indications of a paler or grayer rump patch; in occasional specimens the rump patch more strongly marked, about as in ordinary *sanctidiegi;* top of tail dull buffy brown similar to back, underside pure white; ears on inside grayish, on outside buffy brownish becoming more grayish about base and usually shading into a well-marked blackish border about tip; nape rich bright rusty, almost orange rufous; front and outside of fore legs varying from rich bright cinnamon rufous to dark ochraceous buff shading to ochraceous buff on tops of fore feet; back and outside of hind legs and outside of hind feet brownish cinnamon, sometimes becoming more buffy on sides of hind feet; tops of hind feet white sometimes tinged with buff; underside of neck dark slightly brownish buff (nearly wood brown of Ridgway); rest of underparts pure white.

In spring and summer the overlying black tips of hairs on back wear away, and the buffy ground color fades until the upperparts become nearly uniform dull grayish buffy or sometimes dark buffy grayish.

Juvenal pelage.—Dull, dark, slightly yellowish buffy brown, sometimes with a dull slightly grayish cast; tops of feet and outside of legs deep buffy, sometimes becoming light ochraceous buff; nape pale rusty rufous.

Skull.—Rather broad posteriorly and tapering forward to the tip of the distinctly pointed rostrum; braincase rather broad but not much inflated; anterior half of frontal area and base of rostrum across ends of nasals distinctly flattened; sides of rostrum at base flattened in a vertical plane, thus giving the cross section a well-defined rectangular form; premaxillaries rise on each side of rostrum to upper border of nasals and make a well-defined bead, thus emphasizing the angular form of basal half; rostrum proportionately broad at base and tapering to a narrow pointed tip; supraorbital processes raised above plane of frontals, broad, proportionately heavy, and inner side of postorbital process near tip resting against braincase, thus inclosing a long slender foramen; anteorbital process usually separated from skull by a well-defined notch; zygomatic arch of medium width, strongly grooved, with a deep pit anteriorly; bullæ proportionately small compared with most other forms of this species, and proportionately large compared with the forms of *S. floridanus;* basioccipital rather broad, constricted posteriorly, and rounded on lateral outlines; post-palatal fossa broad.

Average measurements (*5 adults*).—Total length, 418; tail vertebræ, 72.6; hind foot, 86; ear from notch in dried skin, 59.8.

Remarks.—The original description of *S. auduboni* was based on five specimens, three from San Francisco and two from San Diego. No type was mentioned, but skull No. 2045 (belonging to skin 1163), from San Francisco, was figured, and this has properly been considered the type by Miller, who separated the San Diego animal as a geographic subspecies.

No specimens from San Francisco are available, but two undoubtedly typical specimens from across the bay at Berkeley have been compared with the large series of this species from various parts of California. From the material at hand it is evident that true *auduboni* is characterized among its subspecies by its shorter ears, darker color of upperparts, and absence of a grayish rump patch. Its distribution is rather limited, being confined mainly to the Sacramento Valley and northern border of the San Joaquin Valley and adjacent foothills. So far as the material examined goes, there is nothing to prove that any form of this species occurs in the cool humid belt on the west side of the Coast Range, along the immediate coast of California north of Santa Barbara, except where true *auduboni* is found about San Francisco Bay.

Typical *auduboni* is dark ochraceous brown on the upperparts, and specimens from Chico, Marysville Buttes, Colusa, and Los Banos are not distinguishable from an individual in similar fresh pelage from Berkeley. A specimen in fresh pelage from Walnut Creek, east of Berkeley, and one from Nelson, in the Sacramento Valley, are lighter colored and of a richer, brighter shade of ochraceous buffy, especially the last-named specimen. One from Colusa is typical, except for the presence of a grayish rump patch about as in *sanctidiegi*. The ears of a specimen from Los Banos are typically short. Two specimens from Oakdale are true *auduboni* in color, but only one has short ears, the other having long ears like the San Joaquin Valley form, *vallicola*.

Total number of specimens examined 29, from:

California: Belmont, 1; Berkeley, 1; Brentwood, 1; Carbondale, 1; Chico, 7; Chinese Camp, 2; Colusa, 3; Los Banos, 1; Marysville Buttes, 4; Nelson, 3; Oakdale, 2; Red Bluff, 1; Stockton, 1; Walnut Creek, 1.

SYLVILAGUS AUDUBONI VALLICOLA NELSON.

SAN JOAQUIN COTTONTAIL.

Sylvilagus auduboni vallicola Nelson, Proc. Biol. Soc. Washington, XX, pp. 82, 83, July 22, 1907. Type from San Emigdio Ranch, Kern County, California; No. $\frac{31257}{43122}$, ♀ ad., U. S. National Museum (Biological Survey collection); collected by E. W. Nelson, October 22, 1891.

Geographic distribution.—Hot, arid parts of central-interior California in Salinas, Upper Cuyama, and San Joaquin valleys; north to beyond Raymond and south to Walker and Tejon passes. Not found west of the outer Coast Range. Vertical range from about 250 feet in bottom of San Joaquin Valley to 4,500 feet altitude on western slope of Sierra Nevada; zonal range mainly Lower Sonoran, but extending into Upper Sonoran.

General characters.—Size nearly the same as true *auduboni*, but ears much larger; color of upperparts (head and body) paler and more yellowish buffy brown; rusty color on legs paler and more buffy; nape paler rufous and grayish rump patch usually more or less strongly indicated, though rarely well marked; skull as in *auduboni*, but bullæ averaging larger and jugals more slender.

Color in fresh winter pelage.—Upperparts of head and body dull yellowish buffy brown, much paler or less reddish brown than true *auduboni;* top of head usually a little richer than back, with more of a pinkish or light ochraceous shade; sides of body less washed with black but otherwise only slightly paler than back; grayish rump fairly well, and often strongly, marked; top of tail light grayish buffy; outside of ears dull buffy grayish, paler than back and head, with a distinct blackish margin about tip; nape dull, rather pale ochraceous buff (much paler than in *auduboni* or *sanctidiegi*); front and sides of fore legs varying from dull ochraceous buff, almost like nape, to a much deeper more reddish or tawny ochraceous, shading into buffy or whitish buffy on tops of fore feet; back and sides of lower hind legs varying from a pale dull buffy cinnamon, near isabella color, to a deep cinnamon; underside of neck buff, often very pale; rest of underparts white. In worn pelage the black wash wears away, and the general color of upperparts fades to paler dull buff or buffy grayish much lighter than the winter condition.

Juvenal pelage.—Paler than immature of either *auduboni* or *sanctidiegi*, upperparts pale buffy grayish, sides of body grayer; sides of legs deep buffy; tops of feet white.

Postjuvenal pelage.—Upperparts rather pale buffy brownish, paler and less heavily washed with black than adults; sides of body grayer than back; nape pale dull ochraceous buff or pale rusty; gray rump patch indistinctly but evidently present; outside of legs much paler than in adults.

Skull.—Size and general appearance much as in *auduboni* and *sanctidiegi* but rostrum narrower at base, lighter, and slenderer; interorbital breadth narrower; supraorbitals and processes lighter; jugal light and slender, as in *sanctidiegi;* bullæ averaging a little larger than in *auduboni* and about the same as in *sanctidiegi.*

Average measurements (5 adults).—Total length, 402; tail vertebræ, 55; hind foot, 91; ear from notch in dried skin, 69.6.

Remarks.—This pale, buffy yellowish form of *auduboni* occupies the arid San Joaquin and adjacent valleys, and is the connecting bridge between typical *auduboni* and the paler, more grayish, *arizonæ* of the Mohave and Colorado deserts. The series examined in the present connection shows considerable individual variation, but their paler colors distinguish them from *auduboni* and *sanctidiegi*, while their larger size, darker flanks and shoulders (which are but little paler than their backs), and their generally more yellowish buffy color are the readiest superficial characters for distinguishing them from *arizonæ.*

The palest and longest-eared representatives of this form are the series from the Salinas Valley. A specimen from east of the Coast Range, near San Luis Obispo, is clear bright buff heavily darkened with black on upperparts, and, except for its slightly paler color, is scarcely distinguishable from specimens of *sanctidiegi* from Nordhoff and Santa Paula. Specimens from Walker, Tejon, and Tehachipi passes are distinctly referable to the present form, though grading toward the Mohave Desert *arizonæ*. Summer specimens become very much bleached, and are dull gray or pale dull buff, varying much in exact shade. In this condition they are much like worn specimens of *arizonæ*, but the darker sides of *vallicola* usually distinguish them.

A half-grown male from Kern River, 25 miles above Kernville, in July is just assuming its postjuvenal pelage and is a pale buffy gray, as pale as typical *arizonæ*, but the color of other specimens, including various adults from this district, is that of *vallicola*, with which they all agree most closely in size.

Total number of specimens examined 77, from:

California: Alila, 4; Arroyo Seco, 1; Badger, 1; Bear Valley (San Benito County), 2; Bitterwater, 1; Buttonwillow, 1; Cañada de las Uvas, 1; Carrizo Plain, 1; Coalinga, 1; Cuyama Valley, 1; Fort Tejon, 1; Fresno Flats, 1; Goshen, 1; Huron, 7; Jolon, 2; Kern River, 10; Kernville, 4; Orosi, 3; Paraiso Springs, 2; Paso Robles, 1; Pleyto, 2; Porterville, 3; Poso, 2; Priest Valley, 2; Raymond, 3; San Emigdio, 1; San Joaquin River, 1; east of San Luis Obispo, 1; Santiago Springs, 2; Stanley, 2; Tehachipi, 1; near Tejon Pass, 1; Temploa Mountains, 1; Three Rivers, 2; Topo Valley (San Benito County), 4; Tulare Lake, 2; Walker Basin, 1.

SYLVILAGUS AUDUBONI SANCTIDIEGI (MILLER).

SAN DIEGO COTTONTAIL.

Lepus floridanus sanctidiegi Miller, Proc. Acad. Nat. Sci. Philadelphia, October, 1899, pp. 389–390. Type from Mexican boundary line near Pacific Ocean, San Diego County, California (Monument 258); No. 60668, ♀ ad., U. S. National Museum; collected by Dr. E. A. Mearns, July 10, 1894.

Geographic distribution.—Southern California west of the mountains from the southern half of Ventura County to the Mexican border, and Lower California from the coast to western base of Laguna Hansen and San Pedro Martir Mountains and from the northern border south to El Rosario River. Vertical range from sea level at San Diego up to over 4,000 feet altitude on mountains to the east; zonal range mainly Upper Sonoran.

General characters.—In fresh pelage much like typical *auduboni*, but paler on sides of shoulders and body and with the grayish rump patch usually much more strongly indicated and in many specimens fairly well marked; in worn pelage paler; size smaller; ears and bullæ actually larger; jugals smaller, slenderer.

Color in fresh winter pelage (San Diego County).—Upperparts, including top of head, varying from dull ochraceous buffy brown to a clearer or brighter buffy brown shade, often scarcely distinguishable from color of typical *auduboni*, but usually lighter colored or paler buffy; sides of shoulders paler and more grayish buffy; rump sometimes like back, but usually with a more or less distinct grayish area often forming a fairly well-marked rump patch; top of tail agrees with adjoining part of rump, underside white; nape bright rufous approaching orange rufous of Ridgway; outside of ears grayish buffy, grayer about base, and shading into a broad black border about tip; front and outside of fore legs pale dull rusty rufous with an ochraceous tinge, distinctly paler than in *auduboni;* tops of fore feet shading into buffy; back and outside of lower hind legs dull cinnamon brown, sometimes dull buffy brown; tops of hind feet white; underside of neck varying from dull buffy to dull, rather dark wood brown, sometimes with a pinkish tinge; rest of underparts white.

In worn, faded pelage the nape becomes paler rufous, the ears grayer, and rest of upperparts dull grayish or dull yellowish buffy gray, in which condition the generally grayish colors largely obscure the gray rump area.

Postjuvenal pelage.—Pale dull buff lightly washed with black, giving the usual finely pepper-and-salt appearance characteristic of this age in cottontails; top of head more ochraceous buffy; ears paler, more creamy buff than back; sides of body paler than top of back.

Juvenal pelage (Ensenada, Lower California, May 23).—Much as in the young of true *auduboni*, but darker, duller, and more grayish buffy brown; much less ochraceous buffy about head and forepart of body.

Skull.—Closely similar to typical *auduboni*, with the same squarely angular base to rostrum but with bullæ larger; zygomatic arch lighter; jugals much narrower and more slender, forming the strongest character separating the skulls of *sanctidiegi* from those of *auduboni;* palatal bridge broader.

Average measurements (5 adults).—Total length, 398; tail vertebræ, 66; hind foot, 89.6; ear from notch in dried skin, 68.6.

Remarks.—*L. a. sanctidiegi* is not a strongly marked form but has several average characters which serve to distinguish it from the closely related typical *auduboni.* The type is an unusually small individual in much worn and faded summer pelage with unusually short ears. The anteorbital process in the type is fused to the skull, thus closing the anterior notch, and the postorbital process touches the skull along posterior half, thus nearly closing the usual foramen. Specimens from the mouth of the Tia Juana River and National City, which may be considered topotypes, and also those from San Diego, are extremely close to *auduboni* in color and length of ears; more so than specimens from other parts of the range of *sanctidiegi.* A specimen from San Bernardino is brighter and more buffy than typical specimens, and is an intergrade with the desert form to the east. A series taken in Ventura County in fresh winter pelage (Nordhoff, Santa Paula) are paler and brighter buffy, with a heavier wash of black over the back, and the gray rump patch more strongly marked than most specimens examined, though one individual from Witch Creek, San Diego County, is practically the same.

Specimens from the immediate vicinity of the type locality on the lower Tia Juana River indicate that there is a small area near the coast where these cottontails on an average are shorter eared and duller colored than elsewhere in this region. The specimens from immediately about the type locality may be considered rather aberrant representatives of a form which ranges for a considerable distance thence up and down the coast. Four specimens of *sanctidiegi* in the collection of the Philadelphia Academy of Sciences from

Dulzura, California, are similar to others from that section, and from other localities in this region north to Santa Paula and Nordhoff in having long, dark buffy gray ears, darker than the back, grayish buffy brown backs, and a poorly defined dull gray rump patch. They are only slightly paler on the sides than on the back. The specimens of *sanctidiegi* from the area just mentioned differ from those collected in the vicinity of the type locality in having a rather brighter and grayer (or less brownish) color and longer ears. This region back from the immediate coast appears to be occupied by the intergrades between *sanctidiegi* and *vallicola* with an infusion of *arizonæ* from the desert plains to the east.

Owing to the drier climate of its habitat *sanctidiegi* bleaches in spring and summer to a paler color than *auduboni*. Proximity to the coast, where dampness and sea fogs are more prevalent than farther inland, is shown among specimens of *sanctidiegi* by their darker and browner color. It is due to this cause that specimens from about the type locality are darker or duller colored than those from the foothills of the adjacent coast range.

Total number of specimens examined 91, from:

California: Alhambra, 2; Banning, 1; Beaumont, 1; Camerons ranch (San Diego County), 3; summit of Coast Range, 1; Dulzura, 17; Jacumba, 7; Los Angeles, 1; Mexican boundary (San Diego County), 2; Mountain Spring (San Diego County), 3; National City, 4; Nordhoff, 4; Pine Valley, 1; Radec, 1; Redlands, 1; San Bernardino, 1; San Diego, 1; San Felipe Valley, 3; San Fernando, 5; San Jacinto, 1; Santa Monica, 1; Santa Paula, 3; Temescal, 1; Tia Juana River (mouth), 1; Twin Oaks, 2; Warners Valley, 4; Witch Creek, 2; Mount Pinos, 1; Arroyo Seco (near Pasadena), 1.

Lower California: Alamo, 1; Ensenada, 1; La Huerta, 1; Nachoguero Valley, 3; Rancho Viejo, 1; San Matias Pass, 3; Santo Tomas, 1; San Ysidro, 1; Tecate Mountains, 2; Tecate River, 1.

SYLVILAGUS AUDUBONI CONFINIS (ALLEN).

LOWER CALIFORNIA COTTONTAIL.

Lepus arizonæ confinis Allen, Bull. Am. Mus. Nat. Hist., N. Y., X, p. 146 (author's separates issued April 12, 1898). Type from Playa Maria Bay, Lower California, Mexico; No. $\frac{13562}{11911}$, ♀ ad., American Museum of Natural History; collected by A. W. Anthony, July 8, 1897.

Geographic distribution.—Lower California, Mexico, from Rosario River on the west coast and Santa Rosalia on the east side south to Cape St. Lucas. Vertical range from sea level on west coast up to about 3,500 feet in interior of peninsula; zonal range mainly Lower Sonoran, reaching the upper border of the Arid Tropical Zone.

General characters.—Smaller than *auduboni*, with ears shorter and grayer; back brighter, more grayish buffy; legs duller brown; rump patch distinct, iron gray.

Color in fresh winter pelage.—Top of head and back rather clear pinkish buff with a strong wash of black; sides of body grayer, much less strongly washed with black; rump patch nearly clear iron gray; top of tail dusky, grizzled with dull gray; ears buffy gray (clearer gray than in either *auduboni* or *arizonæ*) with well-marked black tips; nape rusty rufous; front of fore legs between cinnamon and fawn color; tops of fore feet pinkish buff; front of hind legs and tops of hind feet white, underlaid on feet with a tinge of buff; back and sides of hind legs drab, sometimes more or less shaded with cinnamon; underside of neck wood brown varying in intensity; rest of underparts white.

Skull.—Much as in *arizonæ*, but a little shorter with smaller bullæ and lighter jugals; agrees with *goldmani* and differs from the other subspecies in having the postorbital process so close to skull that the inner border nearly or quite touches it, thus reducing the usually well-marked foramen to a fine slit, or entirely closing it; bullæ rather short and broadly inflated on inner side in front; basioccipital compressed and forming a shallow trough.

Average measurements (5 adults).—Total length, 361; tail vertebræ, 46; hind foot, 85.8; ear from notch in dried skin, 62.6.

Remarks.—In fresh pelage the colors of the upperparts of this subspecies are brighter and clearer than either in *auduboni* or *arizonæ*, especially the gray on the ears and rump. From near the Rosario River south nearly to La Paz the color of *confinis* usually varies but little, but two specimens (one from San Ignacio and the other from 25 miles west on the desert plain at San Angel) are sandy buffy on the upper parts and indistinguishable in color from typical *arizonæ*. The rest of the specimens from this region are typical. Specimens from La Paz are larger and browner than those from farther north and thus approximate *auduboni*. A good series of specimens from that region may show the existence of a recognizable form peculiar to the extreme southern end of the peninsula. We found no signs of cottontails along the Gulf coast of the peninsula from south of the mouth of the Colorado River to the vicinity of Santa Rosalia, though they may occur somewhat to the north of the last-named place, but apparently not so far north as Calamahue Landing.

Total number specimens examined 30, from:

Lower California (Mexico): La Paz, 6; Mulejé, 2; Playa Maria, 1; Rosarito, 1; San Andres, 6; San Angel, 2; San Bruno, 1; San Ignacio, 4; San Javier, 1; San Jorge, 1; Santo Domingo, 5.

SYLVILAGUS AUDUBONI ARIZONÆ (ALLEN).

ARIZONA COTTONTAIL.

(Pl. XI, fig. 2.)

Lepus sylvaticus var. arizonæ Allen, Mon. N. Am. Rodentia, p. 332, 1877. Type from Beal Spring, 2 miles from Kingman, Arizona, No. $\frac{8442}{1568}$, ♂ ad., U. S. National Museum; collected by Dr. Elliott Coues, September 8, 1865.

Lepus arizonæ major Mearns, Proc. U. S. Nat. Mus., XVIII, No. 1081, p. 557, June 24, 1896. Type from Calabasas, Pima County, Arizona, No. $\frac{18192}{25096}$, U. S. National Museum; collected by Leonhard Stejneger, October 23, 1889.

Lepus laticinctus Elliot, Pub. Field Columbian Museum, Zool. ser., III, No. 14, p. 254, January, 1904. Type from Oro Grande, Mohave Desert, California; in Field Museum of Natural History; collected by Edmund Heller.

Geographic distribution.—Deserts of extreme southern Nevada, California (east of the Sierra Nevada and southern Coast Range) from Owens and Death valleys south across the Mohave and Colorado deserts into northeastern Lower California; nearly all of Arizona below 6,000 feet (except northeastern part) from westerly slopes of San Francisco and White Mountains, south into northern Sonora, Mexico. Vertical range from below sea level in Death Valley up to about 7,000 feet in mountains of western Arizona; zonal range mainly Lower Sonoran, but extending through Upper Sonoran.

General characters.—Smaller and paler, more buffy grayish, than *vallicola;* gray rump patch present; general buffy tinge of upperparts more pinkish or creamy; ears equally large; skull smaller and lighter with rostrum slenderer and bullæ actually, as well as proportionately, much larger.

Color in fresh winter palage.—Upperparts of head and body pale buffy gray, the buffy of a pinkish or creamy shade contrasting with the slightly rusty yellowish shade of *vallicola;* top of back less heavily washed with black than in latter, thus adding to the generally paler color; sides of head and body gray, distinctly paler than back and much paler than in *vallicola;* iron-gray rump patch usually well marked; nape light cinnamon rufous; top of tail similar to rump, or a little darker gray; outside of ears gray or buffy gray (paler than back) and narrowly edged about tip with black; front and sides of fore legs rather dull rusty cinnamon, duller and less rufous than nape and varying to dull ochraceous buff; tops of hind feet white or whitish buffy; back and outside of hind legs and sides of hind feet brownish drab, varying to dull brownish fawn color; tops of hind feet pure white; underside of neck usually dull, slightly buffy, drab varying to dull buff; rest of underparts white.

Color in worn spring and summer pelage.—Upperparts of head and body paler and grayer than in winter, owing to wearing away of black tips of hairs and fading of buffy suffusion; fore and hind legs more rufous or reddish brown from wearing away of pale tips to hairs and to change of color due to exposure to light; ears grayer.

Juvenal pelage.—Upperparts pale brownish gray, a little paler than *vallicola* at same age; nape and legs paler and more rusty buffy than in adults.

Skull.—Similar in type to that of *auduboni*, but much smaller and lighter; rostrum proportionately a little narrower and more pointed; zygomatic arch slender, jugal grooved, with a deep pit anteriorly; supraorbital and both anterior and posterior processes broad and thin, more deeply notched anteriorly than in *auduboni;* postorbital process stands well out from skull in middle, but touches it at posterior end, inclosing a well-marked flattened oval foramen; frontal area flattened; bullæ with rounded and roughened surface, actually as well as proportionately very large, averaging the largest among the forms of *auduboni*, thus forming a strong character; the swollen or greatly inflated form of bullæ in front and on inner side compresses or narrows basioccipital, giving a shallow troughlike form.

As noted in the remarks below, there is considerable local variation in *arizonæ* which extends to the skull. The small-eared specimens from Seligman, Arizona, for example, have correspondingly small bullæ.

Average measurements (5 adults).—Total length, 359; tail vertebræ, 51.4; hind foot, 84.4; ear from notch in dried skin, 68.9.

Remarks.—The present subspecies is distinctly smaller than *auduboni* and *vallicola* with proportionately larger ears, and is much paler, more sandy buffy, on the upperparts, and the legs are paler, more rusty, or buffy reddish, than in *auduboni*, *vallicola*, *confinis*, or *goldmani.* Occasional specimens, however, have the hind legs dull brownish as in *auduboni.* Throughout most of its wide range the pale buffy gray color of the head and body of *arizonæ* is more uniform than is usual with color characters in the *auduboni* group over a similarly wide range. Specimens of *arizonæ* from Death Valley, the Mohave and Colorado deserts in California, most of Arizona, and northern Sonora are practically indistinguishable in color. A series of topotypes of *Lepus laticinctus* Elliot from Oro Grande in the Mohave Desert differ from typical *arizonæ* only in their slightly larger size and larger skulls, characters which are not sufficiently marked to be worthy of recognition and merely show the gradation of *arizonæ* in the western part of its range toward the larger *vallicola* and *sanctidiegi.* In color the topotypes of *laticinctus* are typical *arizonæ*. A series of specimens from Furnace Creek in Death Valley, including the type and topotypes of *Lepus laticinctus rufipes* Elliot, have longer ears than specimens from any other locality; otherwise are typical *arizonæ.* There is much local variation in the size of the ears, usually accompanied by a corresponding variation in the size of the bullæ.

A series from Seligman, Arizona (about 70 miles east and more than 2,000 feet higher than the type locality of *arizonæ*), is typical in color, but has very short ears and small bullæ, thus contrasting strongly with the series from Furnace Creek, California (several hundred miles westerly and over 3,000 feet lower than the type locality), which have unusually long ears and large bullæ.

Specimens from Cabezon, southeast of San Bernardino, Hesperia, Vallecitos, Carrizo Creek, and other localities along the western borders of the Mohave and Colorado deserts in California are darker and larger than typical *arizonæ*, thus showing distinct gradation toward *sanctidiegi*. An adult female from San Matias Pass, Lower California, is another intergrade of this kind, which must be referred to *arizonæ*, and marks the southernmost limit of the form in Lower California. Specimens from the Cocopah Mountains near the lower Colorado River and along the adjacent boundary line average small, but are typical in color. A considerable series from Phoenix, Tucson, Willcox, and other localities through the same section of south-central Arizona average darker buffy than ordinary *arizonæ*, with a heavier overlying wash of black on the back and with the underside of the neck more richly buffy. In size and proportions of body, ears, and skull, including bullæ, these specimens are typical. Various other specimens from the same districts are typical in color. The dark, buffy specimens, however, are from a distinct area nearly coincident with the distribution of the giant cactus, and while the characters are not sufficiently well defined throughout its range to warrant its recognition as a subspecies, it may be considered as an incipient subspecies. A good series of specimens from a little farther south, near the Mexican border of Arizona and well into northern Sonora, are all typical *arizonæ*. The type of *Lepus arizonæ major* Mearns came from the southern border of Arizona in this section. The type is a freshly pelaged fall specimen, with the body made up less than half its natural size, so that the overlying black wash on the back, a little heavier than usual, is concentrated, giving a strikingly and unnaturally dark appearance. All others of the series from the same section are typical *arizonæ*, both in size and color. From as far south as Magdalena, central Sonora, the color remains typical; but the ears and bullæ are smaller, thus grading toward *goldmani*. A specimen from Phoenix, Arizona, is the darkest, most buffy brown example seen, and represents the extreme of individual variation, but its legs are nearly typical and the underside of the neck dull buffy. Others from Tucson are almost equally dark, and worn specimens taken at Gardners Lagoon on the Mexican border in the Colorado Desert have the upper part very reddish, especially about the shoulders, nape, and fore legs, while the underside of the neck is deep ochraceous buff. The skin of the head and neck of a similarly richly colored specimen taken at Yuma, Arizona, also has been examined. These are sporadic cases of extreme individual variation.

Total number of specimens examined 163, from:

California: Brawley, 1; Cabezon, 1; Carrizo Creek, 1; Coso, 2; Coyote Well, 1; Fort Yuma, 8; Furnace Creek, 1; Hesperia, 1; Indian Wells, 1; Lone Pine, 2; Mohave River, 1; Needles, 7; New River Station (San Diego County), 2; Oro Grande, 4; Owen Lake, 2; Palm Spring, 1; Providence Mountains, 2; Resting Spring, 6; 25 miles southwest of Ehrenberg, Arizona, 1; Vallecito, 1; Whitewater, 2.

Nevada: Ash Meadows, 5; Pahrump Valley, 2; Vegas Valley, 2.

Arizona: Beal Spring, 25; Big Sandy Creek, 1; Calluro Mountains, 1; Dolans Spring, 1; Dos Cabesos, 1; Fort Huachuca, 3; Fort Lowell, 3; Fort Verde, 13; Hualpai Mountains, 2; La Osa, 2; Mexican boundary, 5 miles east of Colorado River, 1; Oracle, 6; Phoenix, 8; Quitobaquito, 1; San Pedro River (near boundary), 1; Seligman, 5; Tombstone, 1; Tucson, 5; Wilcox, 1; Yuma, 5.

Lower California (Mexico): Cocopah Mountains, 3; Gardners Lagoon, 7; Hardy River, 1; Salton River, 1; San Matias Pass, 1; Seven Wells, 2; Unlucky Lagoon, 1.

Sonora (Mexico): Magdalena, 1; Oputo, 1; Poso de Luis, 1; San José Mountains, 1; Sonoyta, 5.

SYLVILAGUS AUDUBONI GOLDMANI (Nelson).

Sinaloa Cottontail.

Lepus arizonæ goldmani Nelson, Proc. Biol. Soc. Washington, XVII, p. 107, May 18, 1904. Type from Sinaloa, Sinaloa, Mexico: No. 96809, ♂ ad., U. S. National Museum (Biological Survey collection); collected by E. A. Goldman, February 15, 1899.

Geographic distribution.—Coastal plain and adjacent foothills from near Ortiz, southern Sonora, south to Culiacan, central Sinaloa, and Chacala in extreme western Durango, Mexico. Vertical range from near sea level on west coast of Sinaloa up to about 2,500 feet; zonal range Lower Sonoran and upper part of Arid Tropical Zone.

General characters.—Size midway between that of *auduboni* and *arizonæ*, with smaller, slenderer hind feet; colors brighter and more strongly contrasted than in the other forms; upperparts nearly as dark as in *auduboni* but less brownish; ears buffy gray; legs deep rusty cinnamon, more deeply colored than in any of the other forms, and the rump patch obsolete; bullæ smallest among the subspecies of *auduboni*.

Color, in fresh winter pelage.—Top of head and upperparts cream buff, heavily washed on back with black; sides of body paler and less washed with black; rump patch indistinct or represented by a small, dull iron-gray area about base of tail; top of tail dusky brownish grizzled with dull buff; nape patch bright rusty rufous; ears buffy gray, more strongly black-tipped than in the other forms; front of fore legs dull cinnamon rufous, becoming paler and more buffy on tops of fore feet; back and sides of hind legs and feet russet or rusty cinnamon; front of hind legs and tops of hind feet bright white, sometimes slightly tinged with buffy, in sharp contrast to color on rest of legs; underside of neck varying from dark vinaceous to pinkish buff; rest of underparts white.

Skull.—Much like that of *arizonæ* in size and general form, but postorbital process usually lying close to, or in contact with, the skull, much as in *confinis*, thus much reducing or entirely shutting the long narrow foramen present in the other forms; bullæ actually and proportionately smallest of all the subspecies of *auduboni;* the small bullæ and the rather narrow braincase give the skull of this form a superficial resemblance to that of some of the smaller forms of *S. floridanus.*

Average measurements (*5 adults*).—Total length, 382; tail vertebræ, 52; hind foot, 83; ear from notch in dried skin, 65.6.

Remarks.—The present form resembles *confinis* in the clear buffy of the upperparts, overlaid with a heavy black wash, but the shade of the buffy averages deeper. The absence of a distinct rump patch, the deep, strongly contrasting colors on the legs, and the slender hind feet are characteristic. It may be readily distinguished from *arizonæ* and *minor* by the dark upperparts and the richer color of the legs. The color of the upperparts closely resembles that of *parvulus*, from which the much darker color of the legs readily distinguishes it. *S. a. goldmani* intergrades with *arizonæ* in the region from near Hermosillo south to beyond the Rio Yaqui in Sonora, but specimens from Ortiz and Batomotal, near Guaymas, and thence south are all referable to *goldmani.*

Total number of specimens examined 21, from:

Sinaloa (Mexico): Bacubirito, 1; Culiacan, 4; Sinaloa, 2.
Sonora (Mexico): Batamotal, 2; Camoa, 10; Ortiz, 2.

SYLVILAGUS AUDUBONI MINOR (MEARNS).

LITTLE COTTONTAIL.

Lepus arizonæ minor Mearns, Proc. U. S. Nat. Mus., XVIII, No. 1081, pp. 557–558, June 24, 1896. Type from El Paso, Texas; No. $\frac{20104}{37064}$, ♂ ad., U. S. National Museum; collected by Dr. E. A. Mearns and F. X. Holzner, February 6, 1892.

Geographic distribution.—Extreme western Texas (mainly west of Guadalupe and Davis mountains) and Rio Grande Valley above mouth of Pecos; also plains of extreme southeastern corner of Arizona and southwestern New Mexico, and thence south through plains and foothills of Chihuahua to northern Durango, Mexico, east of the Sierra Madre. Vertical range from about 3,500 to 6,000 feet altitude in Chihuahua; zonal range mainly Lower Sonoran, extending up into the Upper Sonoran Zone.

General characters.—A pale grayish form closely similar to *arizonæ*, but smaller, with shorter ears; skull among the smallest and most delicately formed of the subspecies of *auduboni*, but bullæ proportionately largest.

Color in fresh winter pelage.—General colors pale grayish; top of head and back pale dull grayish buffy, darkened on back with a thin wash of black; sides of head and body without the black wash and paler and grayer; a band of clear dull buffy along lower border of flanks, becoming most strongly marked just back of fore legs; nape pale dull rusty rufous; ears rather dark gray narrowly bordered with black about tips; rump dull iron gray forming a not strongly contrasted rump patch; top of tail dull grayish, much like rump; front and sides of fore legs similar to nape, but darker rusty and shading into pale buffy on tops of fore feet; back and outside of lower hind legs vary from dull cinnamon to dull rusty cinnamon, shading out along outside of hind feet to a paler, more buffy color, the same shade tinging more or less the underfur on tops of feet; underside of neck dull creamy buff varying to grayish buff.

Worn pelage.—In spring and summer the pelage of upperparts bleaches to a whitish gray with only a very pale buffy tinge, but when the long hairs wear away the prevailing color becomes much darker according to the shade of buffy or cinnamon brown of the underfur.

Postjuvenal pelage.—Upperparts pale grayish buffy.

Skull.—Similar to that of typical *arizonæ*, but smaller and more delicately made, with proportionately larger bullæ; rostrum slender and tapering, with nearly straight upper outline and large winglike supraorbitals inclosing a small, narrow foramen between base of postorbital process and skull; parietal width proportionately greater than in *arizonæ;* about same size as in *neomexicanus* but with larger bullæ.

Average measurements (5 adults).—Total length, 351; tail vertebræ, 52.8; hind foot, 80; ear from notch in dried skin, 59.1.

Remarks.—In general appearance this form is much like the pale gray *arizonæ*, but smaller. It occupies a rather restricted belt along the extreme southern border of the United States from the mouth of the Pecos River in Texas to extreme southeastern Arizona and south to extreme northern Durango, Mexico, east of the Sierra Madre. It is typical only in a comparatively limited area in extreme western Texas and west along the Mexican boundary to

Arizona and south to Lake Guzman, Chihuahua. Within these restricted limits the specimens are comparatively uniform in small size and pale gray colors and represent typical *minor*. A series of topotypes from El Paso and two specimens from Lake Guzman, Chihuahua, are gray like the type, while a third specimen from Guzman is darker buffy, similar to typical *cedrophilus*, though its skull is smaller than the average *minor*. Several specimens from Chihuahua City, Mexico, a higher, colder, and more humid location than El Paso, average darker buffy than typical *minor*, and one is as dark as typical *cedrophilus*. Specimens from Santa Rosalia, Chihuahua, also average darker than those from El Paso. A few individuals from Deming, New Mexico, are intermediates in size and color between *minor* and *cedrophilus*, as are others from Jarilla, San Andres, and Tularosa, New Mexico, many of them being as deeply buffy as typical *cedrophilus;* but the small skulls and large bullæ place them with *minor*. One curious specimen of *cedrophilus* from the Datil Mountains in central New Mexico has the large inflated bullæ of *minor* and is grayer than is usual in *cedrophilus*, to which latter form it undoubtedly belongs.

Specimens of *minor* from the type region have the underside of the neck rich buffy as in *cedrophilus*, but this character is often found more or less developed among intergrades.

Specimens from Valentine and the vicinity of the mouth of the Pecos River in Texas are puzzling intergrades with *neomexicanus* and *parvulus*. The material from the base of the Davis and Guadalupe Mountains, Texas, appears to prove that specimens from their eastern foothills should be referred to *cedrophilus*, while those from the western foothills are *minor*, though not typical in either case.

There is a possibility that more thorough field work in the southwest will show that the occasional winter specimens, with rich colors like *cedrophilus*, which are taken on the plains with *minor*, may be intergrades from the neighboring mountains, and that *cedrophilus* inhabits all of the scattered mountains within the range of *minor*, restricting the latter to the arid plains and lower foothills.

Total number of specimens examined 147, from:

Texas: Altuda, 2; Belen, 1; Boquillas, 1; Chisos Mountains, 2; Davis Mountains, 1; El Paso, 5; Fort Hancock, 9; Franklin Mountains, 1; Haymond, 2; Kent, 1; Langtry, 1; Marathon, 1; Marfa, 6; Ogden Canyon, 1; Sierra Blanca, 1; Terlingo Creek, 2; Valentine, 1.

New Mexico: Adobe Ranch, 1; Big Hatchet Mountains, 2; Carrizalillo Mountains, 1; Carrizalillo Spring, 1; Chamberino, 5; Deming, 5; Dog Spring, 4; Guadalupe Ranch, 17; Hachita, 3; Jarilla, 1; La Mesa, 5; Lordsburg, 1; Corner Monument on Mexican boundary, 4; Mexican boundary 40 miles west of El Paso, 8; San Andres Mountains, 3; Redrock, 2; Tularosa, 4.

Arizona: San Bernardino ranch, 2.

Chihuahua (Mexico): Casas Grandes, 1; Chihuahua City, 5; Colonia Diaz, 1; Guzman, 3; Juarez, 1; Mesquite Spring, 2; San Bernardino ranch (near Mexican boundary), 1; San Luis Springs, 1; Santa Rosalia, 2; Whitewater, 2.

Durango (Mexico): Inde, 1; Matalotes, 1; Rancho Bailon, 18; Rio Campo, 1.

SYLVILAGUS AUDUBONI CEDROPHILUS Nelson.

Cedar Belt Cottontail.

Sylvilagus auduboni cedrophilus Nelson, Proc. Biol. Soc. Washington, XX, p. 83, July 22, 1907. Type from Cactus Flat, 20 miles north of Cliff, New Mexico, No. 148287, ♀ ad., U. S. National Museum (Biological Survey collection); collected by Vernon Bailey, November 6, 1906.

Geographic distribution.—Mainly the juniper and pinyon pine belt from Alpine, in the Davis Mountains of Texas, north through mountains of southern half of New Mexico and along the Mogollon range to east side of San Francisco Mountain of east-central Arizona. Vertical range from about 5,000 to 8,000 feet in western New Mexico; zonal range mainly Upper Sonoran.

General characters.—Larger and darker than *minor;* upperparts dark buffy, sometimes dull ochraceous buffy; legs deeper and richer rufous and underside of neck rich ochraceous buffy.

Color in fresh pelage.—Top of head and back varying from dark, slightly grayish, buffy to dull ochraceous buffy washed with black; sides of body grayer with little or no wash of black; rump dull iron gray forming a fairly well-marked patch; outside of ears grayish buffy, with a narrow black border about tip; top of tail buffy grayish brown or dull grayish; nape deep rusty rufous; front and sides of fore legs varying from deep and rather dull ochraceous buff to rich deep rusty rufous; back and sides of lower hind legs vary from dull rusty cinnamon to dark rich rusty cinnamon, and a paler more buffy shade of same extends along outside of hind feet; latter more strongly washed and shaded with rusty buffy than in *minor;* underside of neck varies from deep dull buffy to rich dark ochraceous buffy, commonly much richer and more ochraceous than in *minor* and in this character most resembling *neomexicanus.*

Worn pelage.—Much paler and grayer than in fresh pelage until the long hairs wear down to the rusty or reddish brown underfur of back and the pale tips of hairs on the legs wear off, after which the upperparts become much darker and more rusty or cinnamon brown; the rufous on legs becomes brighter and more intense and the hind feet more rusty or rusty buffy.

Postjuvenal pelage.—Rather dark grizzled buffy, or brownish, gray varying in shade, but averaging darker than in *minor*, with legs darker rusty cinnamon or dull dark rufous; underside of neck dull buffy or dull ochraceous buffy, duller than in adults.

Skull.—Similar in general proportions to that of *minor*, but distinctly larger; bullæ actually, as well as proportionately, smaller: length about equal to typical *arizonæ*, but rostrum proportionately slenderer, braincase broader, and bullæ smaller.

Average measurements (*5 adults*).—Total length, 375; tail vertebræ, 46; hind foot, 89.6; ear from notch in dried skin, 60.7.

Remarks.—*S. a. cedrophilus* is characteristic of the cedar and pinyon grown foothills and elevated mesas, where it is abundant. There is considerable local as well as individual variation, but it is most typical about the basal slopes of the Mogollon, Capitan, and Manzano mountains of New Mexico and the north base of the White Mountains of Arizona. It grades on all sides into other subspecies of *auduboni*, so that a large number of puzzling specimens are encountered, showing all degrees of intermediate characters. The larger size of the skull, compared with *minor*, small bullæ, and rich buffy underside of the neck, with the more or less strongly buffy upperparts, serve to distinguish most specimens.

Lack of material still prevents the determination of the exact limits of the range of this subspecies. A single worn specimen from Alpine, Texas, bleached to a dull iron gray on the upperparts, is duller colored than ordinary *cedrophilus*, but the size and generally dark color with the skull characters are so much nearer the present form than to *minor* that I have placed it here for the present, although the color of the back is unusual and the rounded and proportionately great lateral breadth of the bullæ are peculiarities not possessed by any other specimen examined.

Specimens taken in early winter at about 7,000 feet on the northeast slope of the White Mountains, Arizona, near the upper border of the pinyon belt, are bright buffy on the back, becoming more ochraceous on the sides of the body, and still deeper ochraceous on the underside of the neck. They are nearly as large as *arizonæ*, but have shorter ears as well as brighter colors. Other specimens from farther north along the same slope of the Mogollon range, on the northeastern side of the San Francisco Mountains, at about 6,000 feet altitude, have ears and bullæ nearly equaling those of typical *arizonæ*, but the much darker, more buffy upperparts, rufous legs, and dark buffy underside of neck place them with *cedrophilus*.

Total number of specimens examined 85, from:

New Mexico: Albuquerque, 2; Ancho, 1; Anthony Spring, 1; Bear Spring Mountains, 1; Burley, 1; Burro Mountains, 4; Cactus Flat, 2; Capitan, 8; Capitan Mountains, 5; Copperton, 1; Corona, 1; Cuervo, 1; Datil, 2; Fort Wingate, 2; Gallo Canyon, 1; Gallup, 2; Gila National Forest, 3; Grants, 1; Isleta, 1; Jicarilla Mountains, 3; Manzano Mountains, 7; San Rafael, 1; Santa Rosa, 6; Silver City, 6.
Arizona: Holbrook, 1; San Francisco Mountains, 4; Springerville, 20.
Texas: Alpine (15 miles south), 1.
Chihuahua (Mexico): San Diego, 1.

SYLVILAGUS AUDUBONI WARRENI NELSON.

COLORADO COTTONTAIL.

Sylvilagus auduboni warreni Nelson, Proc. Biol. Soc. Washington, XX, p. 83 July 22, 1907. Type from Coventry, Colorado; No. 148632, ♀ ad., U. S. National Museum (Biological Survey collection); collected by C. H. Smith, January 4, 1907.

Geographic distribution.—Southwestern Colorado, southeastern Utah, northwestern New Mexico, northeastern Arizona, including lower half of valley of the Little Colorado River, to east base of San Francisco Mountain, and to Henry Mountains, southeastern Utah. Vertical range from about 5,000 to 8,500 feet in northwestern New Mexico; zonal range mainly Upper Sonoran, extending into Transition and Lower Sonoran zones.

General characters.—Similar to *baileyi* in size, length of ears, and long abundant pelage; but upperparts, including ears, darker, more buffy brownish, and gray rump patch clearer, more strongly marked; nape and legs darker, more rufous.

Color in fresh winter pelage.—Upperparts of head and body dark creamy buff strongly washed on back with black; sides of head and body grayer and washed with less black than back and shading into clear dull buff along lower border of flanks; outside of ears similar to back, or a little grayer; nape light rusty rufous; rump iron gray, forming a well-defined patch; top of tail like rump; front and outside of fore legs varying from dark rusty ochraceous buff to light rusty cinnamon rufous; tops of fore feet white, more or less shaded with buff; back and outside of hind legs cinnamon, varying to lighter more rusty cinnamon and to darker more cinnamon brown; tops of hind feet vary from white to pale buff; the rusty areas on fore and hind legs connected by buffy line along lower border of flanks; underside of neck varies from dull dark buff to dark buff tinged with fawn color; inguinal area more or less deeply buffy.

Worn spring and summer pelage.—Distinctly darker, more grizzled, buffy brownish than *baileyi*, with deeper rusty areas on nape and legs.

Skull.—Not distinguishable from that of *baileyi.*

Average measurements (5 adults).—Total length, 384; tail vertebræ, 50; hind foot, 97; ear from notch in dried skin, 66.

Remarks.—The present form is separable from *baileyi* only by darker colors; to the south it grades into *cedrophilus* and *arizonæ.* While typical specimens are readily separable from *baileyi*, it shows a considerable range of variation. Specimens from Delta and Grand Junction, Colorado, and Nephi, Utah, are paler and grayer than those from Coventry, and the Delta examples have the tops of the hind feet pure white. The extreme intensity of coloration is shown by specimens from Cortez, Montezuma County, in extreme southwestern

Colorado. In these the nape and outside of fore legs are rich rusty rufous, and the back of the hind legs dark reddish, almost chestnut, brown; the underside of the neck deep ochraceous buffy. Specimens from Grand Junction and Coventry, Colorado, have unusually long ears, measuring over 70 mm. from the notch. A skin from Nephi, Utah, is paler and more brightly colored than typical specimens, and most like others from Delta and Grand Junction, Colorado, which are intermediates with *baileyi*, but nearest the present form.

Two skins from Cieneguilla near central New Mexico are scarcely distinguishable from some of the topotypes from Coventry. Another specimen from the base of the Jemez Mountains, New Mexico, also belongs here. Specimens from the valley of the Little Colorado River and the Painted Desert of northeastern Arizona are rather paler than typical specimens, but otherwise differ but little.

Total number of specimens examined 93, from:

Colorado: Alamosa, 1; Antonito, 1; Ashbaugh's Ranch (Montezuma County), 3; Cortez, 5; Coventry, 16; Delta, 3; Grand Junction, 5; Hotchkiss, 2; Medano Ranch, 3; Paradox, 1; Rifle, 2; Villa Grove, 1.

New Mexico: Aztec, 1; Blanco, 2; Canon Blanco, 1; Chaco Canyon, 5; Cieneguilla, 2; Dulce, 2; Fruitland, 9; Hondo Canyon, 1; Juan Tafoya, 1; San Antonio Mountains, 2; Stinking Springs Lake, 2; Tres Piedras, 1.

Arizona: Holbrook, 1; Keams Canyon, 1; Winslow, 13.

Utah: Canesville, 1; Hankville, 1; Henry Mountains (Mount Ellen), 4.

SYLVILAGUS AUDUBONI BAILEYI (MERRIAM).

WYOMING COTTONTAIL.

(Pl. XI, figs. 4, 6.)

Lepus baileyi Merriam, Proc. Biol. Soc. Washington, XI, p. 148, June 9, 1897. Type from Spring Creek, east side Bighorn Basin, Wyoming; No. 56016, ♂ ad., U. S. National Museum (Biological Survey collection); collected by C. Hart Merriam and Vernon Bailey, September 17, 1893.

Geographic distribution.—Plains and valleys of eastern Montana, most of Wyoming, northeastern Utah, northwestern and eastern Colorado (east of the mountains), western parts of North and South Dakota, Nebraska, and as far east as Trego County, Kansas. Vertical range from about 3,000 feet in Kansas to 7,000 feet in Colorado; zonal range mainly arid Upper Sonoran, but ranging into lower part of Transition Zone.

General characters.—Largest of the subspecies except typical *auduboni;* pelage longest and most abundant of any; ears and feet long-haired as in *pinetis;* color pale, often nearly plain, creamy buff darkened by a thin wash of black.

Color in fresh winter pelage.—Upperparts of head and body nearly uniform pale creamy buff, slightly darkened by thin overlying wash of black; sides of head and body a little paler or grayer than back; rump dull iron gray, forming a not strongly contrasted patch; top of tail like rump; outside of ears similar to top of head, but slightly darker and edged around tip with black; inside of ears dull grayish white becoming more buffy about borders; nape light rufous approaching ochraceous buff; front and outside of fore legs ochraceous buff varying in intensity, sometimes approaching dark buff, and shading into dark buff on tops of fore feet; back and sides of lower hind legs dark buff, sometimes shaded with brownish but rarely showing traces of the darker cinnamon or reddish shades characteristic of *warreni;* lower border of flanks scarcely more buffy than rest of sides; underside of neck dark buff varying to deep pinkish or creamy buff.

Worn spring and summer pelage.—Usually paler and grayer.

Skull.—In size nearest typical *auduboni* and *sanctidiegi* with supraorbital almost equally heavy, the broad processes inclosing posteriorly a well-marked oval foramen, and anteriorly with an even deeper and broader notch; braincase similar in form, but rostrum heavier and more expanded on sides near base; interorbital breadth narrower; zygomatic arch nearly as heavy as in *auduboni* and jugal similarly grooved; molar series strikingly larger and heavier (heaviest among the forms of *auduboni*), and bullæ much larger and more inflated, sometimes equaling in actual diameter the largest examples of *arizonæ*, though always proportionately smaller; basioccipital deeply constricted posteriorly and trough-like. The large size, heavy molar series, heavy rostrum, and broad zygomatic arch distinguish the skull of *baileyi* from the various smaller forms.

Average measurements (*5 adults*).—Total length, 411; tail vertebræ, 57; hind foot, 96.4; ear from notch in dried skin, 64.3.

Remarks.—This is the most strikingly differentiated form of *auduboni*, and is easily recognizable by its large size, pale creamy color, the long abundant pelage, and the hairiness of the ears and feet. It is typical throughout the northern part of its range, but becomes a little darker in northwestern Colorado and along the east base of the mountains in the same State and in western Kansas.

The ears of *baileyi* are usually long, but there is considerable individual variation, in addition to the geographic variation, in eastern Colorado and western Kansas. The individual variation in the skull is most strikingly shown in the bullæ, which usually vary in size correspondingly with the varying length of the ears. In addition to the shorter ears specimens from Kansas and adjacent parts of eastern Colorado compared with typical *baileyi* are smaller, darker, and have distinctly smaller bullæ.

The young in immature pelage are darker and more buffy brownish gray on upperparts than the adults. The postjuvenal pelage is slightly darker and more grizzled gray than the adult, with darker brownish gray ears and more rusty legs. The young are often not very different from those of *arizonæ* and *minor*.

Total number of specimens examined 197, from:

South Dakota: Battle Creek, 1; Cheyenne River (Custer County), 5; Corral Draw (Pine Ridge Reservation), 7; Elk Mountain, 1.

North Dakota: Little Missouri River, 2.

Nebraska: Glen (Sioux County), 1; Warbonnet (Sioux County), 3.

Kansas: Wakeeney, 2; Pendennis, 3.

Colorado: Agate, 1; The Cedars (northwest corner Baca County), 1; Colorado Springs, 8; Denver, 1; Douglas Spring (Routt County), 3; Flagler, 1; Fortification Creek (near Craig), 1; Gaume's ranch (northwest corner Baca County), 7; Lay, 6; Loveland, 8; Bear River (north of Maybelle), 1; Meeker, 2; Monon, 4; Quenda, 1; 20 miles southwest of Rangely, 3; Rockvale, 6; Salida, 3; Sand Creek, 3; Semper, 5; Snake River, 3; Snake River (lower bridge), 6; between Snake River bridge and Lily, 1; Spring Canyon (Larimer County), 1; White River (20 miles east of Rangely), 1; White Rock, 2.

Utah: Uncompahgre Indian Reservation, 5.

Montana: Billings, 1; Box Elder Creek, 1; Great Falls of the Missouri, 1; Little Big Horn River (2 miles from Wyoming line), 3; Phillips Creek, 2; Sage Creek (Big Horn Basin), 4; Stillwater, 1.

Wyoming: Aurora, 3; Beaver, 1; Belle Fourche, 1; Big Piney, 3; Bitter Creek, 18; Camp Carling, 1; Cheyenne, 2; Circle, 2; Deer Creek, 1; Douglas, 6; Fort Bridger, 1; Fort Fettermann, 2; Fort Laramie, 1; Green River, 1; Henrys Fork, 1; Kinney Ranch, 1; Lander, 7; Opal, 2; Owl Creek Mountains, 2; Percy, 5; Rawlins, 1; Sheep Creek, 1; Spring Creek (Bighorn Basin), 1; Van Tassel Creek, 1; Wamsutter (30 miles south), 5; Wind River Basin, 5.

SYLVILAGUS AUDUBONI NEOMEXICANUS NELSON.

NEW MEXICO COTTONTAIL.

Sylvilagus auduboni neomexicanus Nelson, Proc. Biol. Soc. Washington, XX, p. 83, July 22, 1907. Type from Fort Sumner, New Mexico; No. 118477, ♂ ad., U. S. National Museum (Biological Survey collection); collected by J. H. Gaut, September 23, 1902.

Geographic distribution.—Pecos Valley from near Fort Stockton, Texas, north to about Fort Sumner, New Mexico, and thence east to Abilene and Wichita Falls, Texas, and north through eastern New Mexico, western Texas, and western Oklahoma to extreme south-central Kansas. Vertical range from about 2,500 feet in western Texas to 5,000 feet in eastern New Mexico; zonal range Lower Sonoran and lower part of Upper Sonoran Zone.

General characters.—Size about as in *minor;* ears shorter; hind feet longer; color generally darker and more rusty reddish, especially on legs and sides of body; fore legs more strongly rusty rufous, shading to rusty buffy on tops of fore feet; sides of shoulders and along lower part of flanks more or less strongly rusty buffy, deepest on shoulders and shading into rusty cinnamon on outside of hind legs; winter pelage thinner and shorter than in *minor*.

Color in fresh pelage.—Top of head and back dull, rather dark buffy gray with a slight tinge of rusty buffy; sides of body grayer than back with a stronger tinge of rusty buffy, becoming nearly pure rusty buffy along lower border of flanks and most intense on sides of shoulders; deepening to rather bright rusty rufous on sides of fore legs and shading into dark buffy on tops of fore feet, and into rusty cinnamon on outside of hind legs; tops of hind feet varying from pale buffy to whitish; nape rather rufous, duller and paler rufous than on fore legs; outside of ears pale grayish buffy; rump covered with a poorly defined dull iron grayish patch; top of tail dull buffy gray; underside of neck varying from dark rusty buffy, deeper than sides of flanks, to deep ochraceous buffy.

Worn summer pelage.—Upperparts paler and more dingy grayish, but the generally rusty or rusty buffy tinge nearly always distinctive.

Skull.—In size and general appearance much like that of *minor*, but with frontal area more flattened, interorbital breadth greater, nasals longer, and bullæ distinctly smaller.

Average measurements (5 adults).—Total length, 374; tail vertebræ, 49; hind foot, 87; ear from notch in dried skin, 55.

Remarks.—This is not a strongly marked form, but at the same time the cottontails from the low open country of eastern New Mexico and middle western and northwestern Texas have so much more rusty reddish on the legs and shoulders, so much of a rusty buffy tinge over the rest of the body and so much smaller ears that they do not fit in with any of the adjacent forms, and it has seemed best to distinguish them by name. As would be expected, they grade into the other forms on the south, west, and north. To the east they occupy the limit of the range of this species. Specimens from the southern part of their range have the longest ears and largest bullæ; those from the north, about the northeastern border of the Panhandle, and thence to southern Kansas, have much shorter ears and smaller bullæ than from elsewhere in the range of this form, and thus grade toward the small representatives of *baileyi* in middle western and northern Kansas.

Specimens from the lower Pecos Valley in New Mexico are similar to those from about Colorado and adjacent parts of western Texas. Through lack of material the exact area of intergradation between *neomexicanus* and *parvulus* is unknown.

The range of this subspecies overlaps that of *S. floridanus chapmani* in middle western Texas, but I have seen no specimens which suggest intergradation.

Total number of specimens examined, 85, from:

New Mexico: Carlsbad, 5; Clayton, 2; Emery Peak, 1; Fort Sumner, 4; Guadalupe Mountains, 4; Perico Arroyo, 4; Roswell, 11; Sierra Grande, 2; Tucumcari, 1.

Texas: Adam, 1; Canadian, 1; Colorado, 3; Davis Mountains, 2; Fort Stockton, 4; Gail, 1; Grand Falls, 2; Hereford, 1; Lipscomb, 5; Monahans, 9; Pecos City, 1; San Angelo, 1; Stanton, 2; Tascosa, 1; Tebo, 1; Texline, 3; Toyah, 1; Toyahvale, 2; Wichita Falls, 2.
Oklahoma: Chattanooga, 2; Neutral Strip, 2; Tepee Creek, 2.
Kansas: Kinsley, 1; Kiowa, 1.

SYLVILAGUS AUDUBONI PARVULUS (ALLEN).

MEXICAN DESERT COTTONTAIL.

(Pl. XI, fig. 3.)

Lepus (*Sylvilagus*) *parvulus* Allen, Bull. Am. Mus. Nat. Hist., XX, pp. 34–36, figs. 3, 6, 9, February 29, 1904. Type from Apam, Hidalgo, Mexico (altitude about 8,000 feet); No. $\frac{12578}{10558}$, American Museum of Natural History; collected by Frank M. Chapman, March 19, 1897.

Geographic distribution.—Eastern and southeastern part of Mexican Tableland from Puebla north to Rio Grande Valley of Texas (from Rio Grande City to mouth of Pecos River). Vertical range from below 500 feet on the Rio Grande to over 8,000 feet altitude on southern end of tableland in Mexico; zonal range Upper and Lower Sonoran.

General characters.—Upperparts dusky buffy grayish; nape and fore legs deep rusty rufous, hind legs dull cinnamon brown; size and proportion of *minor* but deeply colored, more like *goldmani.*

Color of fresh winter pelage.—Upperparts of head and body dusky buffy gray, the buffy having a pinkish shade on head and fore part of body and giving way posteriorly to a dull, poorly marked iron gray rump patch; top of tail similar to rump; sides of head and body paler, less washed with black than back; ears buffy gray, paler and grayer than back; nape deep rusty rufous; fore legs similar to nape but darker rufous; tops of fore feet buffy varying in intensity; lower part of hind legs usually cinnamon brown varying to a lighter more rufous shade; tops of hind feet vary from white to buff; underside of neck dark buff or ochraceous buff, in some cases becoming dark buffy drab; a narrow band of dull buff, similar to but duller than underside of neck, extends along lower edge of flanks bordering white area of abdomen between front and hind legs.

Worn spring and summer pelage.—Paler more yellowish gray, especially on the sides of body where the yellowish buffy suffusion is most strongly marked.

Skull.—Much as in *minor*, but interorbital width and bullæ averaging a little smaller and jugals lighter.

Average measurements (*5 adults*).—Total length, 359; tail vertebræ, 45.8; hind foot, 76; ear from notch in dried skin, 57.3.

Remarks.—This subspecies is most like *goldmani*, but its colors, especially on the legs, are less intense and less strongly contrasted.

In fresh dark pelage some examples of *parvulus* have strikingly close external resemblance in size and color to *S. f. chapmani*, both forms ranging over the same area in the lower Rio Grande Valley and adjacent part of northern Mexico. In the northern part of its range intergrading specimens of *parvulus* are often nearly as pale as *minor*. Its fur is thinner and more finely grizzled by the overlying black than in *minor*, so that by these characters pale individuals may usually be distinguished. In addition specimens from the Rio Grande Valley and adjacent part of Tamaulipas and Nuevo Leon usually have smaller ears and smaller bullæ than from any other part of its range. One specimen from Chalchicomula, Puebla, and another from Miquihuana, Nuevo Leon, have ears and bullæ as large as typical *arizonæ*. The ears and bullæ vary locally in this as in other forms, and there may be an average difference between series from two places not widely separated. Most specimens from the extreme northern part of its range may be at once separated from *S. floridanus chapmani* by the well-marked difference in the size of the bullæ, as well as by color, but some are very close in color, and the bullæ are so nearly intermediate in size that they are very puzzling. The two species live together over a considerable area without intergradation. Occasionally individuals of *parvulus* in the overlapping parts of their ranges resemble *chapmani* in general appearance, but such cases are too sporadic to mean anything except a parallelism resulting from similar conditions, as has been noted in several other species of American rabbits.

Total number of specimens examined 122, from:

Texas: Carrizo, 3; Comstock, 2; Cotulla, 2; Del Rio, 6; Mouth of Devils River, 4; Eagle Pass, 1; Laredo, 5; Llano, 1; Rio Grande City, 1; Roma, 2; San Diego, 1; Sycamore Creek, 1; Webb County, 2.
Coahuila (Mexico): Carneros, 2; Las Vacas Creek (head of), 1; La Ventura, 4; Monclova, 1; Sabinas, 2; Saltillo, 6.
Tamaulipas (Mexico): Camargo, 6; Guerrero, 1; Mier, 6; Miquihuana, 3; Nuevo Laredo, 3.
Nuevo Leon (Mexico): Aldama, 1; Rodriguez, 1.
San Luis Potosi (Mexico): Ahualulco, 2; Charcos, 2; Hacienda La Parada, 5; Rio Verde, 4; San Luis Potosi, 6; Soledad, 1.
Aguas Calientes (Mexico): Chichalote, 4.
Zacatecas (Mexico): Berriozabal, 3; Cañitas, 1.
Durango (Mexico): Durango City, 2.
Jalisco (Mexico): Lagos, 1.
Guanajuato (Mexico): Silao, 1.
Queretaro (Mexico): Tequisquiapam, 2.
Hidalgo (Mexico): Irolo, 2; Apam, 2; Tulancingo, 3.
Tlaxcala (Mexico): Huamantla, 1.
Puebla (Mexico): Chalchicomula, 2.
Vera Cruz (Mexico): Perote, 10.

SYLVILAGUS CUNICULARIUS Group (Subgenus SYLVILAGUS).

MEXICAN COTTONTAILS.

The present group is characteristic of, and probably originated on, the high plains and mountain slopes at the southern end of the Desert Plateau Region, which is coincident with the southern end of the Mexican Tableland. The *cunicularius* group is very distinct from the other cottontails. It contains only two species, one of which is wide ranging and separable into three forms, namely, *S. cunicularius*, *pacificus*, and *insolitus*, and the other, *S. graysoni*, an insular species of very limited distribution, was probably derived from *S. c. insolitus* of the adjacent mainland. The members of this group are characterized by coarse pelage, massive skulls, and large size, *S. cunicularius* being about as large as a medium-sized jack rabbit. While having no close relatives, they most resemble the large, heavy-skulled, coarse-haired *S. floridanus yucatanicus* and *S. f. chiapensis*.

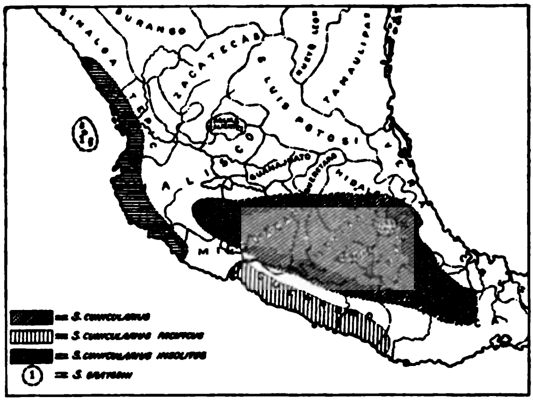

FIG. 15.—Distribution of the Mexican cottontails of the *Sylvilagus cunicularius* group.

S. cunicularius (including its subspecies) occupies a broad area, including the lofty mountains and adjacent borders of the cool plains about the southern end of the Mexican Tableland, and thence west and south in the tropical belt along the Pacific coast (see fig. 15). It thus possesses a great vertical range, from an altitude of more than 11,000 feet in the Canadian Zone on the giant volcanoes down to sea level on the Arid Tropical coast plains. The range of typical *S. cunicularius* is the most extended and varied of the three subspecies. Its range reaches from above 11,000 down to about 2,000 feet altitude, thus including the Canadian, Transition, Upper and Lower Sonoran, and the upper part of the Arid Tropical Zone. The distribution of the other forms, *pacificus* and *insolitus*, in common with *S. graysoni*, is Arid Tropical. In contrast with the wide vertical range of typical *cunicularius*, that of *graysoni* extends only from sea level up to about 200 feet. The range of typical *cunicularius* overlaps a considerable part of the ranges of *S. f. connectens* and *S. f. restrictus*, and all of that of *S. f. orizabæ*. In addition, on the slopes of Mount Popocatepetl and Mount Iztaccihuatl, the limited habitat of *Romerolagus* *nelsoni* is wholly within that of *cunicularius*, and on the borders of the adjacent plains *cunicularius* occurs in company with the plains cottontail, *S. auduboni parvulus*, and the jack rabbits, *Lepus callotis* and *L. c. festinus*.

S. cunicularius and its subspecies have habits much like those of the forms of *S. floridanus*. They usually avoid open plains, and frequent the rank growths of bushes or coarse saccaton grass in the scattered pine and oak forest of the mountain slopes and similar growths about the foothills along the borders of the plains. Still lower they frequent grass-grown thickets in the tangled jungle of the hills and valleys in the hot country. At night they leave cover to feed about the openings and along the edges of the jungle.

Average measurements of the Sylvilagus cunicularius group.

	No. of specimens averaged.	Skin.				Skull.							Origin of specimens averaged.
		Total length.	Tail vertebræ.	Hind foot.	Ear from notch, in dried skin.	Basilar length.	Length of nasals.	Breadth of rostrum above premolars.	Depth of rostrum in front of premolars.	Interorbital breadth.	Parietal breadth.	Diameter of bullæ.	
Sylvilagus cunicularius.	5	511.6	67.8	109.4	74.4	62.3	36.4	21.2	17.0	19.4	29.3	11.4	Las Vigas, Vera Cruz.
Sylvilagus cunicularius pacificus.	5	489.0	62.2	110.8	70.7	61.9	36.5	20.1	18.4	19.5	28.1	11.2	Coast of Guerrero, Mexico.
Sylvilagus cunicularius insolitus.	5	500.0	54.6	108.8	70.4	62.4	37.0	23.1	18.9	21.0	28.3	11.8	Plains of Colima.
Sylvilagus graysoni...	5	480.0	51.4	96.8	57.0	61.5	34.0	20.4	17.1	18.6	26.7	11.0	Maria Madre Island.

SYLVILAGUS CUNICULARIUS (Waterhouse).

Mexican Highland Cottontail.

(Pl. XIII, figs. 7, 8.)

Lepus cunicularius Waterhouse, Nat. Hist. Mammalia, II, pp. 182–183, footnote, 1848. Type from Sacualpan (probably in State of Mexico), Mexico; No. 1503, Berlin Museum; collected by F. Deppe. July 26, 18—.

Lepus veræcrucis Thomas, Proc. Zool. Soc. London, June 1, 1890, pp. 74–75, pl. 7. Type from Las Vigas, Vera Cruz, Mexico; in British Museum; collected by the Geographical Exploring Commission of Mexico.

Geographic distribution.—Mountains about extreme southern end of Mexican Tableland and bordering slopes and valleys on both sides from Cofre de Perote and Mount Orizaba in central-western Vera Cruz, and Mount Zempoaltepec, eastern Oaxaca, west through southern Hidalgo, Puebla, Tlaxcala, Mexico, northern Michoacan, Morelos, northern Guerrero, and northern Oaxaca. Vertical distribution from about 2,000 feet in Guerrero up to over 11,000 feet on Mount Orizaba and on the mountains about the Valley of Mexico; zonal distribution from upper part of Arid Tropical up through Sonoran and Transition into Canadian Zone.

General characters.—Very large and heavy, equaling medium-sized jack rabbits in weight; color dull buffy brownish gray; pelage abundant and coarse.

Color in fresh winter pelage.—Top of head buffy brown, washed with black; back pale buffy yellowish gray darkened by overlying long black hairs; ears similar to top of head, becoming blackish on outside at tip; orbital area clear deep buffy; sides of head dark dingy buffy; nape dull rusty rufous; fore legs similar to nape, but duller, less rufous; hind legs and sides of hind feet duller, more rusty brownish, than fore legs; tops of hind feet buffy whitish or pale dull rusty; line along lower side of flanks between front and hind legs dull rusty buff; underside of neck a little lighter shade of same; rest of underparts dingy whitish.

Skull.—Large and heavy, rather broad across braincase; rostrum heavy with a massive base, flattened in frontal region and arched along upper outline; nasals sharply compressed laterally into a pit-like indentation about one-third of length from tip and expanded again toward tip; jugals proportionately light, slightly grooved, with a deep pit anteriorly; supraorbital process light and narrow and but slightly raised above plane of frontals; postorbital process usually joined to skull posteriorly inclosing a narrow flattened-oval foramen; braincase proportionately broader than in *S. floridanus aztecus*, *S. f. yucatanicus*, and *S. f. chiapensis;* bullæ medium sized, proportionately about as in *yucatanicus;* considerable similarity in general appearance exists between skulls of *S. cunicularius* and *S. f. yucatanicus*, but supra- and postorbital processes of *cunicularius* smaller and narrower, and postorbital process less closely joined to skull; jugals lighter and teeth, both incisors and molars, larger and heavier; lower outline of rami of underjaw on a plane surface usually rest on posterior angle and tip, leaving middle free; in old skulls middle lower outline sometimes becomes convex, raising tip free.

Average measurements (*5 adults*).—Total length, 511.6; tail vertebræ, 67.8; hind foot, 109.4; ear from notch in dried skin, 74.4.

Remarks.—*Lepus aquaticus* has been recorded from Orizaba, Vera Cruz, but the specimen upon which this record was based is still in the National Museum, and proves to be a typical example of *Sylvilagus cunicularius.* As stated in the general introduction, neither *S. aquaticus* nor *S. palustris* occurs in Mexico.

S. cunicularius has a wide range and is abundant in many places, frequenting the cover offered by rank growths of coarse grass or weeds. It is equally at home at an elevation of 10,000 or 11,000 feet in the grass-grown areas of the open pine forest on the giant volcanoes of Orizaba and Popocatepetl, or at 2,000 feet in the subtropical plains and valleys of southern Puebla and northern Guerrero.

Specimens of this species from the Sierra Madre of Michoacan, in the western part of its range, are a little larger in dimensions of both skin and skull than those from elsewhere, but there are no color differences. In worn pelage the general color becomes paler and more of a dingy yellowish gray. Considering the wide range of this species under such varied conditions of climate, the amount of variation is surprisingly small.

In his Natural History of Mammalia (loc. cit.) Waterhouse published a fairly good description of some specimens of cottontails in the Berlin Museum, based on notes given him by Bachman. Waterhouse used the manuscript name *cunicularius* which Lichtenstein had placed on the labels of these specimens. This description was based on two specimens which, during a recent visit to Berlin, Osgood found in the mounted collection of the museum, still in good condition. They were carefully examined by him and proved to be unquestionably identical with the species described as *Lepus veracrucis* by Thomas.[a] The ear measurements of the two original specimens were taken by Osgood and absolutely confirm this determination. Both specimens were collected by Deppe and are labeled for locality in his writing. One is labeled from "Xalapa" (= Jalapa, Vera Cruz) and the other came from "Sacualpan" (probably in the southern part of the State of Mexico). This last specimen is marked both on the label and in the museum catalogue as the type, so that we may consider "Sacualpan" (= Zacualpan) as the type locality of this fine species.

Total number of specimens examined 104, from:

Michoacan (Mexico): Patzcuaro, 18.
Guerrero (Mexico): Chilpancingo, 1.
Mexico (Mexico): Amecameca, 1; Mount Iztaccihuatl, 1; Mount Popocatepetl, 4; Salazar, 3; Volcano of Toluca, 6.
Federal District (Mexico): Ajusco, 1; Tlalpam, 1.
Morelos (Mexico): Cuernavaca, 1; Huitzilac, 1; Tetela del Volcan, 1; Yautepec, 4.
Hidalgo (Mexico): Tulancingo, 4.
Puebla (Mexico): Atlixco, 9; Chalchicomula, 1; Piaxtla, 1; Tehuacan, 7; Tochimilco, 1.
Vera Cruz (Mexico): Cofre de Perote, 1; Las Vigas, 23; city of Orizaba, 4; Perote, 7.
Oaxaca (Mexico): Huahuapam, 1; Mount Zempoaltepec, 4; Oaxaca City, 2; Suchistepec, 1.

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[a] Proc. Biol. Soc. Washington, XX, pp. 51-52, April 18, 1907.

SYLVILAGUS CUNICULARIUS PACIFICUS (NELSON).

ACAPULCO COTTONTAIL.

Lepus veræcrucis pacificus Nelson, Proc. Biol. Soc. Washington, XVII, p. 104, May 18, 1904. Type from Acapulco, Guerrero, Mexico; No. 70622, ♂ ad., U. S. National Museum (Biological Survey collection); collected by E. W. Nelson and E. A. Goldman, January 9, 1895.

Geographic distribution.—Coastal plain and adjacent foothills of southwestern Mexico from extreme southern Michoacan through Guerrero to Pluma, Oaxaca. Vertical range from sea level in Guerrero to about 2,500 feet in the foothills; zonal range, Arid Tropical.

General characters.—Similar in color to *cunicularius*, but smaller, with shorter ears, proportionately longer hind feet, heavier rostrum, and narrower braincase.

Color.—Scarcely distinguishable from typical *cunicularius*.

Skull.—In general appearance much like typical *cunicularius*, from which it differs in narrower but deeper and heavier rostrum, broader, and more inflated tip to nasals, lighter jugals, larger postorbital processes, and narrower braincase; lower outline of rami of lower jaw usually with a marked convexity posterior to symphysis, so that when placed on a plane the mandible rests on lower edge of angular process and on convexity, thus raising part along symphysis free from the support; in some cases this convexity becomes so reduced that lower side of mandible along symphysis nearly or quite touches plane.

Average measurements (*5 adults*).—Total length, 489; tail vertebræ, 62.2; hind foot, 110.8; ear from notch in dried skin, 70.7.

Remarks.—The general resemblance in coloration and in type of skull between *cunicularius*, *pacificus*, and *insolitus* proves their near relationship. A specimen from El Limon in northwestern Guerrero, a place intermediate between the ranges of *pacificus* and *insolitus*, is an exact intergrade between them. The amount of individual variation is not great. The upperparts of the winter specimens are darker with a much heavier wash of black than in spring and summer, when the long black overlying hairs wear away and the buffy underfur fades so that the general color becomes decidedly paler or more grayish.

At the time of our journey through the hot coastal plain near Sihuatanejo, Guerrero, in the dry season, these rabbits were abundant in low situations about weedy old fields and in the bordering scrubby jungle, where the vegetation was greener than on the more arid higher ground.

Total number of specimens examined 19, from:

Guerrero (Mexico): Acapulco, 12; El Limon, 3; Papayo, 2; Sihuatanejo, 1.
Oaxaca (Mexico): Llano Grande, 1.

SYLVILAGUS CUNICULARIUS INSOLITUS (ALLEN).

COLIMA COTTONTAIL.

Lepus insolitus Allen, Bull. Am. Mus. Nat. Hist., N. Y. III, pp. 189–190. December 10, 1890. Type from the plains of Colima, State of Colima, Mexico; No. $\frac{2655}{2133}$, ♂ ad., American Museum of Natural History; collected by Dr. Audley C. Buller, January 15, 1890.

Geographic distribution.—Coastal plains of western Mexico from Michoacan north through Colima and Territory of Tepic to Mazatlan, Sinaloa. Vertical range from sea level in Colima to about 3,500 feet on west base of Volcano of Colima; zonal range, Arid Tropical.

General characters.—A large, coarsely haired cottontail, more brightly colored than *cunicularius*, with back deep buffy brownish, heavily washed with black; sides of legs bright rusty reddish; front of legs and feet white, in strong contrast to sides of same; skull with very heavy rostrum and broad frontal area.

Colors in fresh winter pelage.—Top of head deep buffy ochraceous washed with black; base of ears similar, but becoming blackish near tip; orbital area and sides of nose dingy buffy; cheeks dark buff washed with black; upperparts dark buff or brownish buff (sometimes tinged with reddish, especially on rump) heavily washed with black; nape, fore legs, and sides and back of hind legs, bright rusty rufous; tops of fore and hind feet and front of hind legs clear white, in strong contrast to rufous on rest of legs; top of tail dull rusty brown, underside white; underside of neck deep yellowish buff; rest of underparts white.

Skull.—In general resembles that of *cunicularius*, but base of rostrum much heavier (broader and deeper); frontal and interorbital area more flattened and greater (in depth of rostrum it agrees with *pacificus*); jugals heavier; lower outline of rami nearly straight, so that the mandible, on a plane surface, usually rests on lower part of angular process and ends of rami along symphysis, leaving the slightly convex middle part of rami free.

Average measurements (5 adults).—Total length, 500; tail vertebræ, 54.6; hind foot, 108.8; ear from notch in dried skin, 70.4.

Remarks.—The strong contrast between the bright rusty reddish of the nape and legs with the clear white on the feet and along the front of the hind legs strongly marks this cottontail, which, like *pacificus*, is limited to a belt along the Pacific coast of Mexico. It merges into *pacificus* in southern Michoacan and northern Guerrero. Specimens from northern Tepic and southern Sinaloa have a slenderer rostrum than those from the type region.

In fresh pelage the colors are deep and rich, with a strong wash of black on the upperparts. In spring and early summer they become much worn and faded and decidedly paler, changing to dull grayish buffy.

Total number of specimens examined 60, from:

Colima (Mexico): Armeria, 9; City of Colima, 1; Hacienda Magdalena, 4; Manzanillo, 1.
Jalisco (Mexico): Ixtapa, 6.
Territory of Tepic (Mexico): Acaponeta, 10; San Blas, 2; Santiago, 6.
Sinaloa (Mexico): Esculnapa, 13; Mazatlan, 6; Rosario, 2.

SYLVILAGUS GRAYSONI (ALLEN).

TRES MARIAS COTTONTAIL.

Lepus graysoni Allen, Mon. N. Am. Rodentia, pp. 347–348, August, 1877. Type from the Tres Marias Islands, western Mexico; No. 8318, U. S. National Museum; collected by A. J. Grayson.

Geographic distribution.—Tres Marias Islands, western Mexico. Vertical range from sea level to about 200 feet; zonal range Arid Tropical.

General characters.—Smaller than any form of *cunicularius;* most like *S. c. insolitus* in color, especially the bright rufous nape and legs, but upperparts more reddish, and with decidedly smaller ears and lighter skull.

Color in rather worn pelage.—Top of head reddish brown; orbital area and sides of head deep buff, washed on cheeks with black; ears grizzled rusty brown becoming blackish about tips; back and sides of body deep fulvous buffy with a distinct tinge of reddish, especially on rump and tail; nape, most of fore and hind legs, and sides of hind feet bright rusty rufous; tops of feet and line along front of hind legs white or buffy whitish; underside of neck dull brownish buffy; rest of underparts white.

Skull.—Lightest of the *cunicularius* group; proportionately slenderer than the others; nasals unusually short; interorbital and parietal width narrow; supraorbital and postorbital processes generally united to braincase along entire length, about as in *S. palustris;* rostrum strikingly slenderer than in *insolitus;* undersides of rami of lower jaw, between angular processes and symphysis, nearly straight, so that when placed on plane the jaw rests on angular processes and anterior end of jaw, leaving middle parts free.

Average measurements (*5 adults*).—Total length, 480; tail vertebræ, 51.4; hind foot, 96.8; ear from notch in dried skin, 57.

Remarks.—*S. graysoni* is a well-marked insular species, but its general coloration and type of skull clearly show its close relationship to *S. cunicularius insolitus* of the adjacent mainland. The distribution of this cottontail on the islands appears to be unaccountably limited to a vertical range of about 200 feet above sea level. Within this area it is fairly well distributed.

In May, 1897, it was extremely abundant and unsuspicious about the brush-grown fields of an abandoned ranch near the north end of Maria Madre Island. We found it on the three northern islands of the Tres Marias, but during our short visit to the southerly Maria Cleofas saw no sign of it, and it is doubtful if this rocky island affords suitable situations for it.

Total number of specimens examined 21, from:

Territory of Tepic (Mexico): Maria Madre Island, 20; Maria Magdalena Island, 1.

SYLVILAGUS BACHMANI Group (Subgenus SYLVILAGUS).

PACIFIC COAST BRUSH RABBITS.

The brush rabbits of California and Lower California make a well-marked group, the various forms of which bear an unusually close general resemblance to each other. There are only two species, *Sylvilagus mansuetus* and *S. bachmani*, with its subspecies *ubericolor*, *cinerascens*, *exiguus*, *cerrosensis*, and *peninsularis*. With the exception of typical *bachmani* and *ubericolor*, all occur in Lower California. Of these *cinerascens* is the only one which inhabits both sides of the border.

The distribution of *S. bachmani* and its subspecies is practically that of the group. They occupy a comparatively narrow belt from the Columbia River in Oregon south through California, including the foothills of the Sierra Nevada on the east side of the Sacramento and San Joaquin valleys to Cape St. Lucas at the extreme southern point of Lower California. (See fig. 16.) In the northern part of Lower California they range inland from the Pacific coast to the summit of the Laguna Hansen Mountains, and high up on the west slope of the San Pedro Martir Range. Near the middle of the peninsula they extend across to the gulf shore and thence south occupy all the country except the higher mountains. Their range also extends to Cerros Island on the Pacific side, but on San José Island, on the Gulf side, they are replaced by the closely related *mansuetus*.

This group belongs to the Transition and the Upper and Lower Sonoran zones, and in northern Lower California ranges from sea level up to 6,000 feet on the Laguna Hansen Mountains and to 7,000 feet on the San Pedro Martir Mountains; the latter, so far as I am aware, being its greatest altitude. Farther south on the peninsula they rarely go over 3,000 feet above sea level, and on the mountains of the Cape region appear to be absent above 2,000 feet.

The brush rabbits appear to be more strictly nocturnal than the cottontails of the *auduboni* group, and during the day lie very closely in the densest thickets of bushes or other small herbage. They appear to be equally at home in the heavy vegetation of the humid coast region of Oregon and northern California and in the matted growths of thorny plants on the arid deserts of Lower California.

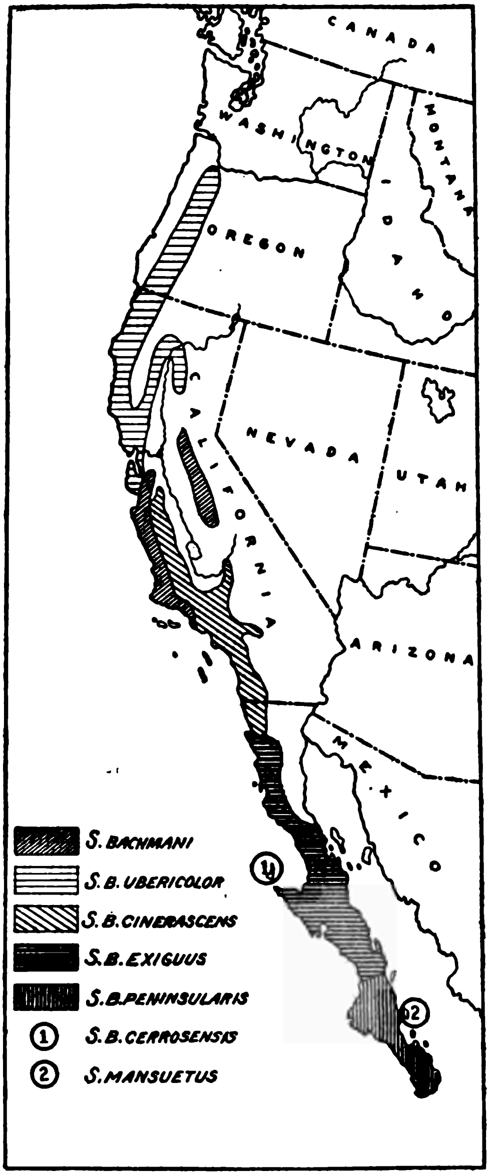

FIG. 16.—Distribution of the brush rabbits, *Sylvilagus bachmani* group.

The members of the group are characterized externally by small size, short legs, small tail, and nearly uniform dark brown or brownish gray color. The skull is broad across the base, the rostrum slender and tapering, and the supraorbital processes light and slender.

The small size and short legs and tail constitute a strongly marked specific type very different from any other group in the subgenus *Sylvilagus*. Alive they appear like dwarf cottontails. In general the skulls bear a rather close resemblance to those of *S. auduboni arizonæ*. The subspecies of *bachmani* vary little in size, but the effect of environment on color is well shown by the contrast between the dark brown *ubericolor* from the humid coast country north of San Francisco, and the gray forms from the more arid regions of southern California and the peninsula of Lower California. Specimens from the district about San Luis Obispo, California, may be considered typical *bachmani*.

The fine series of specimens in the Biological Survey collection from many points throughout the range of this species show that typical *bachmani* intergrades with *ubericolor* on the north and *cinerascens* on the south; and, through the latter, passes into several forms of Lower California. *S. mansu-*

etus from San José Island is undoubtedly an offshoot from *peninsularis*, the form of the adjacent mainland, but it has become sufficiently differentiated through isolation to be treated as a species. It is possible that adults of *cerrosensis* may show well-marked differences, and the form may prove to be worthy of specific rank, but the available material is too imperfect and immature to decide this.

Average measurements of the Sylvilagus bachmani group.

	No. of specimens averaged.	Skin.				Skull.							Origin of specimens averaged.
		Total length.	Tail vertebræ.	Hind foot.	Ear from notch, in dried skin.	Basilar length.	Length of nasals.	Breadth of rostrum above premolars.	Depth of rostrum in front of premolars.	Interorbital breadth.	Parietal breadth.	Diameter of bullæ.	
Sylvilagus bachmani....	5	328	31.5	74.5	54.6	47.9	27.2	15.9	10.9	14.0	23.9	9.8	Monterey and near San Luis Obispo, California.
Sylvilagus bachmani ubericolor.	5	360	37.0	78.6	49.9	51.1	27.6	17.3	12.8	14.7	25.2	8.7	Northwestern California and Oregon.
Sylvilagus bachmani cinerascens.	5	313	34.6	71.6	56.5	46.5	25.7	15.5	10.8	13.8	24.3	10.3	San Fernando and neighboring districts, California.
Sylvilagus bachmani exiguus.	5	314	31.0	72.0	63.9	47.6	25.4	14.4	10.9	14.1	23.7	11.5	Central Lower California.
Sylvilagus bachmani peninsularis.	1	325	25.0	70.0	57.7	47.6	26.0	14.2	11.5	15.0	23.1	10.2	Cape St. Lucas, Lower California.
Sylvilagus bachmani cerrosensis.	2	347	40.0	75.0	53.7	47.8	25.2	14.2	11.8	14.2	23.9	11.3	Cerros Island, Lower California.
Sylvilagus mansuetus...	1	339	44.0	73.0	63.0	49.5	29.0	15.8	13.0	17.2	23.9	11.5	San José Island, Lower California.

SYLVILAGUS BACHMANI (WATERHOUSE).

CALIFORNIA BRUSH RABBIT.

(Pl. X, figs. 6, 7.)

Lepus bachmani Waterhouse, Proc. Zool. Soc. London, 1838, pp. 103–105. Type from California, probably between Monterey and Santa Barbara (specimens from near San Luis Obispo may be considered typical); No. 53.8.29.36, British Museum; collected by David Douglas.

Lepus trowbridgei Baird, Proc. Acad. Nat. Sci. Philadelphia, 1855, p. 333. Type from Monterey, California; No. $\frac{810}{1235}$, U. S. National Museum; collected by Lieut. W. P. Trowbridge in 1853.

Geographic distribution.—California, from Monterey to Santa Monica on west side of the Coast Range; and western foothills of Sierra Nevada from Tulare County to Shasta County. Vertical range along coast from sea level up to over 3,000 feet altitude in adjacent mountains; zonal range semihumid Upper Sonoran into semihumid Transition Zone (mainly Upper Sonoran).

General characters.—Size small (total length less than 350 mm.); ears, legs, and tail short; color of upperparts dark grayish brown with a tinge of dull reddish; darker and more reddish than *cinerascens* but less reddish than *ubericolor;* skull proportionately lighter than in *ubericolor;* braincase broad and rostrum rapidly tapering.

Color in fresh winter pelage.—Upperparts, including head, dark grayish brown with a slight reddish tinge; sides of body and rump a little grayer than top of back, but no distinct rump patch; nose and sides of head paler and grayer than in *ubericolor;* ears nearly uniform dark grayish brown, usually darker than back, with a narrow blackish margin about tip but no sign of a black patch; nape rather dark rusty rufous; top of tail like rump, underside white; sides of shoulders and upperparts of fore legs on outside deep dull cinnamon rufous, varying in intensity and shading into dull dark buffy or grayish buffy on tops of fore feet; outside of hind legs a little more reddish than upperparts of body; tops of hind feet dingy whitish with a slight shade of dull buffy; underside of neck varying from dull, slightly brownish buffy to pale dull cinnamon; underside of head and body dull white with the plumbeous underfur showing through.

Skull.—Proportionately rather small and light, the broad braincase and rapidly tapering rostrum giving it a roughly conical form; supraorbitals small with a fairly broad connection with the skull and long slender postorbital process nearly or quite touching skull at posterior tip and inclosing a narrow slit-like foramen or notch; anterior notch in supraorbitals usually narrow, but well marked; braincase short and rounded; jugals medium heavy; molar series and palatal bridge rather small; bullæ proportionately large and rounded; basioccipital proportionately large.

The skull of typical *bachmani* is intermediate in size and proportions between those of typical *ubericolor* and *cinerascens*, but is nearer *cinerascens*, owing to its small size, light form, large bullæ, and small rostrum.

Average measurements (*5 adults*).—Total length, 328; tail vertebræ, 31.5; hind foot, 74.5; ear from notch in dried skin, 54.6.

Remarks.—*Lepus bachmani* was described from a specimen sent to England by David Douglas during his travels in California. No type locality was given, but the fact that during his travels Douglas journeyed from Monterey to Santa Barbara and sent home other specimens of rabbits from this region makes it possible that the type of *bachmani* also came from somewhere in the same area. Fortunately the type is still in the British Museum, and on his recent trip abroad W. H. Osgood made direct comparison of skins and skulls of specimens from various parts of California with the type. In skin and skull characters the type of *bachmani* agrees with the form found along the immediate coast of California from Monterey south, and confirms the idea that it came from that region, so the name should be fixed on this form. Specimens from the coast near San Luis Obispo are most typical. It may be noted that the type is a mounted specimen in rather faded condition, but the skull, although somewhat broken, is in fair condition for comparison.

In 1855 Baird described *Lepus trowbridgei*, saying that the type came either from Monterey or San Francisco. Specimens of this rabbit were collected at both places by Lieutenant Trowbridge, but in the original museum catalogue entry the type is recorded from Monterey. The skin, with the original label, no longer exists, but the evidence of the catalogue is sufficient to fix the type locality at Monterey, and thus renders *trowbridgei* a synonym of *bachmani*. The skull of the type of *trowbridgei*, with one side and the lower part of the braincase gone, still remains in the National Museum.

Typical *bachmani* belongs to the narrow coast belt west of the Coast Range, between Monterey and Santa Barbara. From Santa Barbara to Santa Monica, while still referable to *bachmani*, they are paler with larger ears and larger bullæ, thus indicating intergradation with *cinerascens*. Inland from Santa Monica, as soon as the humid belt on the coastal slope passes into the more arid area on the east side of the Coast Range, *bachmani* passes into the paler *cinerascens*. To the north of Monterey it grades into *ubericolor*. One of the series examined from near San Luis Obispo is as strongly reddish as ordinary *ubericolor*, but its skull is smaller and lighter. A specimen from Posts, near Monterey, has a large heavy skull with small bullæ, thus in this character approaching closely to *ubericolor*.

Posts is located in the continuation of the redwood belt south of Monterey Bay, and it is possible that additional specimens from there may show that they belong to *ubericolor*, and that the range of this form to the south is really coterminous with the redwoods, while specimens from the immediate coast about Monterey and south are true *bachmani*. Owing to the complication of zone distribution in California a great amount of detail work is necessary to determine properly the distribution of many mammals. This is particularly true of *bachmani*, *cinerascens*, and *ubericolor*, and their exact ranges around the borders of the Sacramento and San Joaquin valleys are still imperfectly known. Specimens from the Santa Clara Valley, north of Monterey, vary greatly, some being like *ubericolor* in color and others approaching *bachmani*. These are all intergrades referable to *ubericolor*. The series from the lower slopes of the Sierras between Shasta County and northern Tulare County are not typical of any of the forms, but in color are nearest to *bachmani*, to which they have been referred, though they have long ears like *cinerascens*.

In southern Tulare County and in Kern County they are paler and are referable to *cinerascens*.

Total number of specimens examined 35, from:

California: Auburn, 3; Badger, 2; Black Mountain (Santa Clara County), 1; Carbondale, 4; Carmel River, 1; Coulterville, 2; Hueneme, 1; Monterey, 2; Morro, 6; Mount Hamilton, 1; Portola, 6; Posts, 1; San Luis Obispo, 2; Santa Maria, 1; Santa Monica, 2.

SYLVILAGUS BACHMANI UBERICOLOR (MILLER).

REDWOOD BRUSH RABBIT.

Lepus bachmani ubericolor Miller, Proc. Acad. Nat. Sci. Philadelphia, October, 1899, pp. 383–384. Type from Beaverton, Oregon; No. $\frac{12864}{15871}$, U. S. National Museum; collected by A. W. Anthony.

Geographic distribution.—Mainly humid coast belt from near Monterey Bay, California, north to near Columbia River (Beaverton), Oregon, and inland in northern California to head of Sacramento Valley at Tehama and Stillwater. Vertical range from sea level up to 1,000 feet or more in northern California; zonal distribution mainly Humid Transition.

General characters.—Size a little larger than *bachmani;* ears smaller; upperparts darker and more reddish; skull much heavier, with smaller bullæ.

Color in fresh winter pelage.—Upperparts, including top of head, warm, dark reddish brown, slightly paler along sides of head and body; ears uniform dark buffy brown with a slight blackish border at tip but no black patch; top of tail similar to rump, underside white; nape dark rusty rufous; outside of fore leg, and outside of hind leg near heel, and adjoining part of hind foot dark cinnamon-rufous; tops of fore and hind feet dull grayish tinged with buffy; underside of neck dingy buffy; underside of head and body dull white or grayish white with slaty bluish underfur showing through, the white sometimes more or less strongly shaded with buffy; in latter case underside of neck differs but little from rest of underparts; in worn and faded spring and summer condition color of upperparts becomes duller and grayer.

Skull.—Similar in general style to that of *bachmani*, but decidedly heavier in general proportions, with longer, heavier, and less tapering rostrum, much smaller supraorbital processes, with a broad notch anteriorly and the postorbital process short and usually extended out from the skull in a tapering point, so as to leave a broad oval notch in place of the narrow foramen usually present in *bachmani;* braincase proportionately narrower and more depressed than in *bachmani;* jugals and molar series heavier; in typical specimens palatal bridge broader and bullæ actually, as well as proportionately, much smaller.

The long heavy rostrum, small supraorbitals, and narrow braincase give the entire skull a much narrower, less tapering form than in *bachmani.*

Average measurements (5 adults).—Total length, 360; tail vertebræ, 37; hind foot, 78.6; ear from notch in dried skin, 49.9.

Remarks.—This dark reddish brown form, with a large skull, fades in spring and summer to a grayer more dingy color on upperparts, but generally remains darker than its closest relative, *bachmani*, at the same season. Typical specimens of *ubericolor* may be always distinguished by the small ears and small bullæ. Specimens from Oregon and the extreme northwestern part of California are the extremes of the subspecies, with dark reddish brown upperparts, very small ears, large heavy skulls, and small bullæ. To the south both ears and bullæ increase in size, and at Point Reyes nearly equal those of *bachmani*, though the dark colors and heavily proportioned skull, with broad heavy rostrum, remains marked enough to distinguish them.

One specimen each from Stillwater and Tehama at the north end of the Sacramento Valley, while evidently intergrades between the representatives of *bachmani* from the foothills of the Sierra Nevada and the present form, are most closely related to *ubericolor*, with which they closely agree in their dark colors, small ears, and small bullæ, though the skulls are proportionately small and light, with a long postorbital process, as in *bachmani.* Although *ubericolor* is characterized by its reddish brown color, there is considerable variation in the exact amount. The type from Beaverton, Oregon, at the extreme northern point of its range, is the most deeply reddish example seen, though occasional specimens from other parts of its range, notably Point Reyes, Berkeley, and the Santa Cruz Mountains near Redwood City, are almost equally reddish. A number of specimens from the coast in extreme northwestern California are more heavily washed with black and less reddish than most others; these, however, have heavy skulls, small ears, and bullæ as in the Oregon specimens.

The range of *ubericolor* in California appears to coincide in a general way with that of the redwoods as far south as Monterey Bay. More material is needed to decide whether it is or is not the form inhabiting the strip of redwoods south of Monterey Bay, although the character of a single specimen from Posts indicates the possibility of *ubericolor* being found there. In case this proves true, then *bachmani* gives way to *ubericolor* as the name of the form inhabiting the redwood belt of this district.

Total number of specimens examined 91, from:

Oregon: Beaverton, 2; Eugene, 1; Grande Ronde, 1; Portland, 1; Roseburg, 1; Salem, 2.

California: Alton, 1; Belmont, 2; Berkeley, 8; Boulder Creek, 2; Bridgeville, 1; Camp Meeker, 2; Crescent City, 4; Freestone, 1; Glen Ellen, 5; Harris, 1; Harris Mill (near Sherwood Valley), 1; Haywards, 1; Humboldt Bay, 9; Marshall, 1; Mount Sanhedrin, 2; Nicasio, 8; Palo Alto, 1; Petrolia, 1; Point Reyes, 15; Presidio, 4; Redwood City, 2; Rio Dell, 1; San Francisco, 2; Smith River, 2; Stillwater, 4; Tehama, 1; Willets, 1.

SYLVILAGUS BACHMANI CINERASCENS (ALLEN).

CALIFORNIA BRUSH RABBIT.

Lepus cinerascens Allen, Bull. Am. Mus. Nat. Hist., N. Y., III, p. 159, October, 1890. Type from San Fernando, Los Angeles County, California; No. $\frac{3882}{2302}$, ♀ ad., American Museum of Natural History; collected by E. C. Thurber, March 22, 1890.

Geographic distribution.—Arid brush-grown slopes of southern and western sides of San Joaquin and neighboring valleys in California, as far north as Jolon and Jamesburg and thence south throughout southern California west of the summit of the mountains (reaching the coast south of Santa Monica) and along the coast of Lower California from northern border south to Ensenada and east to summit of Laguna Hansen Mountains. Vertical range, from sea level up to 6,000 feet altitude in northern Lower California; zonal range, through Upper Sonoran Zone up into Transition (mainly Upper Sonoran).

General characters.—Much like *bachmani*, but upperparts lighter grayish brown; underparts grayer; tops of feet whiter and ears larger; skull smaller and lighter, with larger bullæ.

Color in fresh winter pelage.—Upperparts, including top of head, dark grayish brown or dull buffy brown, a little paler and more grayish on sides of head and body; spring and summer specimens much paler and grayer; nape dull rusty rufous; top of tail similar to rump, underside white; rump like rest of back, except in some specimens, which show traces of a grayish rump patch; ears rather lighter grayish brown than back, with a slight blackish edging about tip in some specimens, but without trace of black in many; front of fore legs cinnamon buff or russet on front and outside near body and shading down on fore feet into dull buffy gray; back and sides of hind legs duller than fore legs and nearly russet brown, shading into dull white on tops of hind feet; underside of neck like sides of body; rest of underparts clearer white than in *bachmani*, but underlaid with plumbeous, which shows through and tinges the white; lower flanks next to abdomen grayer and much less brown than in *bachmani*. In worn pelage the black tips of hairs on back wear away and entire upperparts fade until back becomes buffy grayish brown, sometimes almost clear grayish brown, and sides of body still paler gray; in this condition legs lose much of the russet or cinnamon tinge and become more like back, and nape fades to dull rusty or pale cinnamon.

Skull.—Similar to that of *bachmani*, but averaging a little smaller and lighter, with larger bullæ; size small, proportions light; posteriorly rather broad; braincase full and rounded; rostrum slender and tapering; nasals with straight upper outline; supraorbitals light, slender, and usually with a well-marked anterior notch; postorbitals slender, and tapering posteriorly to a point nearly or quite touching skull in adults, as in *bachmani;* zygomatic arch rather light, with or without a shallow groove on outer side, and small pit near anterior end; bullæ proportionately large, but not much swollen or inflated on inner side; basioccipital rather broad and flattened, not much constricted posteriorly, about as in *bachmani.*

Average measurements (*5 adults*).—Total length, 313; tail vertebræ, 34.6; hind foot, 71.6; ear from notch in dried skin, 56.5.

Remarks.—*S. b. cinerascens* has commonly been treated as a distinct species, but its proper position as a subspecies of *bachmani* was indicated by Doctor Merriam in Science, n. s., VII, No. 158, p. 32, January 7, 1898.

Specimens from as far south as Santa Ysabel, in San Diego County, are nearly typical, but those from Dulzura, San Diego, and other points along the Mexican boundary, while having the color of typical *cinerascens*, have larger ears and bullæ, and are intermediate between *cinerascens* and *exiguus.* The belt of intergradation crosses the Mexican border, and specimens from as far south as Ensenada and Hansen Laguna, in the Hansen Laguna Mountains, although not typical, should be referred to *cinerascens.*

The series from Santa Paula, Nordhoff, and other points not far from the coast, have a heavier overlying black wash on the upperparts, and thus are darker than specimens from the drier inland valleys, especially from the western side of the San Joaquin Valley and from the valley of the Salinas River (Paraiso Springs, Jolon, etc.).

Total number of specimens examined 96, from:

California: Arroyo Seco (near Pasadena), 1; Bear Valley (San Benito County), 1; Dulzura, 20; El Nido Post Office, 2; Escondido, 1; Fort Tejon, 1; Frazier Mountain (Ventura County), 1; Heneger Flats (San Gabriel Mountains), 1; Jacumba, 1; Jamesburg, 1; Jolon, 1; Laguna (San Diego County), 1; Little Pine Canyon, 1; Mount Pinos, 1; Nordhoff, 3; Mexican boundary (Pacific Ocean), 1; Pacheco Pass, 1; Paraiso Springs, 1; Pine Valley (Monterey County), 4; Piute Mountains (Kern County), 4; Redlands, 1; Riverside, 1; San Bernardino, 4; 20 miles east-southeast of San Bernardino, 1; San Bernardino Peak, 1; San Diego, 2; San Fernando, 5; San Jacinto, 1; San Jacinto Valley, 1; east of San Luis Obispo, 2; San Rafael Mountains, 3; Santa Paula, 1; Santa Ysabel, 7; Temploa Mountains, 1; Topo Valley (San Benito County), 2; Twin Oaks, 4; Wheatlands, 2; Whitewater, 1; Witch Creek, 2.

Lower California (Mexico): La Huerta, 1; Tecate Valley, 5.

SYLVILAGUS BACHMANI EXIGUUS NELSON.

LOWER CALIFORNIA BRUSH RABBIT.

Sylvilagus bachmani exiguus Nelson, Proc. Biol. Soc. Washington, XX, p. 84, July 22, 1907. Type from Yubay, central Lower California, Mexico; No. 139607, ♂ ad., U. S. National Museum (Biological Survey collection); collected by E. W. Nelson and E. A. Goldman, September 19, 1905.

Geographic distribution.—Arid middle part of peninsula of Lower California from Alamo Plain and Trinidad Valley south to Comondu. Vertical range, from sea level at San Quentin to about 7,000 feet on San Pedro Martir Mountains; zonal range, mainly Upper and Lower Sonoran, extending into Transition on mountains.

General characters.—Similar in size and form to *cinerascens*, but with much longer ears and larger bullæ; upperparts paler with ground color more pinkish buffy; nape, feet, and legs paler and a fairly well-marked gray rump patch.

Color in fresh winter pelage.—Top of head and back pinkish buff darkened by overlying black tips to hairs; sides of body and rump patch grayer than rest of back; ears grayer and less buffy than back; nape pale dull ochraceous; fore legs vary from pale fawn color to dull cinnamon; fore feet whitish, washed with pale fawn color; back and sides of hind legs paler than in *cinerascens* and so slightly shaded with brown that they differ but little from color of back; tops of hind feet clear white; top of tail like rump, underside white; underside of neck paler than in *cinerascens*, sometimes nearly uniform with white on rest of underparts, but usually like sides of body or a little paler; underparts whiter and less heavily underlaid with plumbeous than in *cinerascens*.

Skull.—Generally similar to that of *cinerascens*, but with distinctly larger bullæ.

Average measurements (5 adults).—Total length, 314; tail vertebræ, 31; hind foot, 72; ear from notch in dried skin, 63.9.

Remarks.—This subspecies belongs to the most desert parts of Lower California. It intergrades with *cinerascens* in the northern part of the peninsula from near San Quentin to Ensenada. Some specimens from San Quentin are fairly typical in color, but others are more like *cinerascens*, the size of the ears and bullæ alone determining their relationship.

Total number of specimens examined 40, from:

Lower California (Mexico): Agua Dulce, 1; Alamos, 1; 30 miles east of San Quentin, 1; Piñon, 2; Rancho El Progreso, 11; Rancho Santo Tomas, 1; Rancho Viejo, 3; Rosarito, 1; San Andres, 3; San Jose, 5; San Quentin, 5; San Simon, 4; Santana, 1; Yubay, 1.

SYLVILAGUS BACHMANI PENINSULARIS (ALLEN).

CAPE ST. LUCAS BRUSH RABBIT.

Lepus peninsularis Allen (Thomas MSS.), Bull. Am. Mus. Nat. Hist., N. Y., X., pp. 144–145, April 12, 1898. Type from Santa Anita, Lower California, Mexico; ♀ ad., British Museum; collected by D. Coolidge, July 17, 1896 (collector's number 438).

Geographic distribution.—Southern part of Lower California on both coasts, and interior from about Comondu and Loreto south to Cape St. Lucas. Vertical range from sea level up to about 2,000 feet in region near Comondu; zonal range Lower Sonoran and border of Arid Tropical Zone.

General characters.—Most like typical *cinerascens*, including length of ears, but head and upperparts paler and grayer; ears paler and more brownish.

Color in fresh winter pelage.—Top of head, back, and tail grayish brown with a strong suffusion of dull buff; sides of head and body paler and grayer than back; rump patch obsolete; ears pale buffy brown; nape patch pale dull rusty, paler than in true *cinerascens;* fore legs dingy cinnamon rufous, deeper than in *cinerascens;* tops of fore feet pale brownish gray; back of hind legs dull rusty; tops of hind feet white; underside of neck dull cream buff; rest of underparts dingy whitish, with dull plumbeous underfur showing through.

Skull.—Similar to that of *exiguus*, but bullæ smaller; size intermediate between the last-named form and *cinerascens;* compared with latter, supraorbital and postorbital processes broader (and latter usually touching skull posteriorly); anterior notch of supraorbitals less marked; interorbital width greater; nasals averaging shorter.

Measurements (1 adult).—Total length, 325; tail vertebræ, 25; hind foot, 70; ear from notch in dried skin, 57.7.

Total number of specimens examined 5, from:

Lower California (Mexico): Cape St. Lucas, 4; Santa Anita, 1.

SYLVILAGUS BACHMANI CERROSENSIS (ALLEN).

CERROS ISLAND BRUSH RABBIT.

Lepus cerrosensis Allen, Bull. Am. Mus. Nat. Hist., N. Y., X, p. 145, April 12, 1898. Type from Cerros Island, Lower California, Mexico, No. $\frac{13561}{11910}$, ♀ ad., American Museum Natural History; collected by A. W. Anthony, April 17, 1897.

Geographic distribution.—Cerros Island, Lower California. Vertical range from sea level up to an undetermined altitude on the low mountains of the island; zonal range Upper Sonoran.

General characters.—Upperparts nearly uniform grayish brown, like typical *cinerascens*, but slightly darker and more buffy, with tops of fore and hind feet distinctly buffy.

Color in slightly faded April pelage.—Upperparts, including top of head, dull grayish brown, with a dull buffy suffusion; sides of body slightly paler than back and becoming more buffy along lower border of flanks, especially near fore legs, than *cinerascens;* sides of fore legs dull rusty cinnamon, distinctly paler and duller than in *cinerascens;* back of hind legs even less reddish brown than in latter form and differing but slightly from back; tops of hind feet dull buff; fore feet darker buff; nape dull cinnamon, lighter and duller than in *cinerascens;* sides of head and ears a little grayer than back, top of tail similar to rump; underside of neck dull cream buff or wood brown; rest of underparts dull white, with anal region and underside of tail pure white in sharp contrast.

Skull.—The only fully adult skull examined most resembles that of *cinerascens*, with rostrum slender and nasals and postorbital processes narrower; bullæ smaller than in *exiguus* and larger than in *cinerascens;* molar series and jugal heavier and palatal bridge broader than in either *exiguus* or *cinerascens.*

Measurements of a fully adult specimen.—Total length, 350; tail, 40; hind foot, 75; ear from notch in dried skin, 59.7. Skull: Basilar length, 49.6; length of nasals, 26.4; breadth of rostrum over premolars, 14.7; depth of rostrum in front of premolars, 12.2; interorbital width, 14.9; parietal breadth, 24; diameter of bullæ, 11.5.

Remarks.—The type, and until recently the only known specimen of this subspecies, is a nearly grown individual, but so immature that the skull does not show the permanent characters. The colors, however, are practically like those of the adult. Fortunately, Mr. W. W. Brown obtained three specimens on Cerros Island in April, 1906, among which were one good adult and one nearly adult. This added material, although too imperfect to fully decide the matter, appears to show that *cerrosensis* is a poorly marked subspecies of *bachmani*, most like *cinerascens.*

Total number of specimens examined 4, from:

Lower California (Mexico): Cerros Island, 4.

SYLVILAGUS MANSUETUS NELSON

SAN JOSÉ ISLAND BRUSH RABBIT.

Sylvilagus mansuetus Nelson, Proc Biol. Soc. Washington, XX, pp. 83–84, July 22, 1907. Type from San José Island, Gulf of California; No. 79041, ♀ ad., U. S. National Museum (Biological Survey collection); collected by J. E. McLellan, August 2, 1895.

Geographic distribution.—San José Island, Gulf of California. Vertical range from sea level up to an undetermined altitude on low mountains; zonal range Lower Sonoran and upper border of Arid Tropical Zone.

General characters.—Size of *cinerascens;* palest of all the members of this group; color much paler and grayer even than in *exiguus;* ears long, equaling those of *exiguus.*

Color of type, assuming winter pelage.—Top of head and back light buffy or yellowish gray, a little darkened by unusually short black tips to hairs; sides of body paler and grayer; ears gray; nape dull and rather pale ochraceous buff; fore legs ochraceous clay color, shading into dingy white on fore feet; back of hind legs only slightly browner than back; tops of hind feet pure white; underside of neck a little paler than sides of body; rest of underparts white, much less strongly underlaid with plumbeous than in *exiguus* or true *cinerascens.*

Skull.—Proportionately longer and narrower than in any of the forms of *bachmani;* nasals very long, thus accenting the long slender appearance of rostrum; supraorbital process broader and heavier than usual in this group, and ankylosed to skull anteriorly, thus giving an unusual interorbital breadth; postorbital process narrow and tapering, barely touching skull posteriorly, and inclosing large oval foramen; bullæ large and round as in *exiguus;* basioccipital narrow and compressed by bullæ into a shallow trough shape, only slightly constricted posteriorly; jugal broader and heavier than in the subspecies of *bachmani.*

Measurements (1 adult).—Total length, 339; tail vertebræ, 44; hind foot, 73; ear from notch in dried skin, 63.

Remarks.—This rabbit, though closely related to, and evidently derived from, a subspecies of *bachmani,* is so much paler than any form of that species and has such well-marked skull characters, combined with an insular habitat, that it seems best to treat it as specifically distinct.

It is known from a single adult specimen. which, fortunately, is in good condition, with a perfect skull.

Total number of specimens examined 1, from:

Lower California (Mexico): San José Island, 1.

Subgenus TAPETI Gray.

Tropical Forest Rabbits and Swamp Rabbits.

SYLVILAGUS GABBI Group (Subgenus TAPETI).

CENTRAL AMERICAN FOREST RABBITS.

The present group contains *Sylvilagus gabbi* and its two subspecies, *incitatus* and *truei,* with *S. insonus*—all, so far as known, limited to tropical North America between the Isthmus of Panama and middle Mexico (see fig. 17). For many years *gabbi* was treated as a subspecies of *Lepus* [now *Sylvilagus*] *brasiliensis,* but the latter name has been restricted by Thomas to a very distinct species living near Rio de Janeiro, Brazil. *Sylvilagus gabbi* and its subspecies are medium-sized, short-eared, dark-colored rabbits, with extremely small tails. They live in the heavy tropical forest, usually near openings, natural or artificial, which they visit at night. By day they keep so closely hidden in the forest that they are extremely difficult to find. The most effective method of securing them is by trapping or snaring them in their well-worn runways in the undergrowth at the borders of the forest. The *gabbi* group is known from both sides of the continent in Panama, Costa Rica, southern Mexico, and Guatemala. We have no proof of their occurrence on the Pacific side between Guatemala and Costa Rica, but this is no doubt due to our almost complete lack of information concerning the mammals of that region. When that area is explored it is more than probable that *gabbi* will be found wherever conditions are favorable.

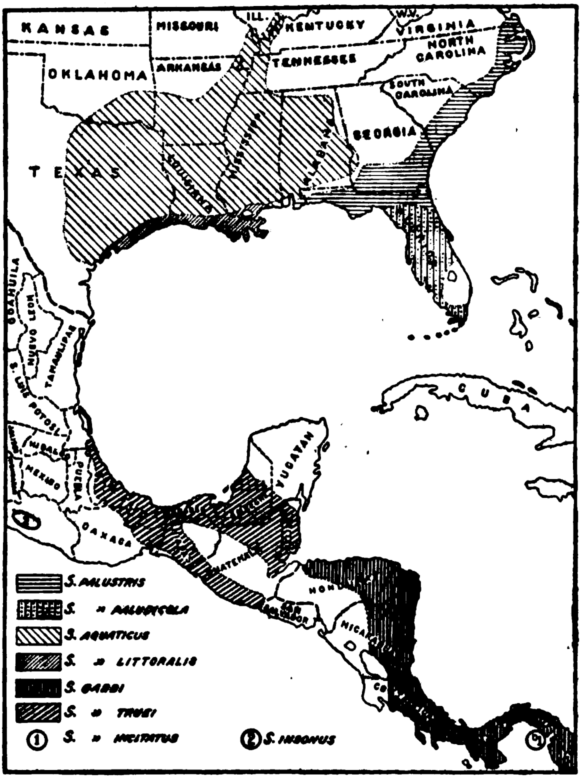

FIG. 17.—Distribution of the swamp rabbits (*Sylvilagus palustris* group) and the tropical wood rabbits (*Sylvilagus gabbi* group).

In eastern Costa Rica *S. gabbi* ranges through the heavy tropical forest from the low coastal plains up to at least 5,000 feet on the mountains; and in the similar forests of eastern Mexico *S. g. truei* occupies the coastal plains of Tabasco and thence up to 5,000 feet on the mountains of Chiapas, and has a similar range in Vera Cruz. A young and apparently melanistic specimen of *gabbi* was collected at 2,600 feet altitude on the east slope of the volcano of Turrialba, Costa Rica, by Robert Ridgway, who informs me that the resident natives assured him that all the rabbits in this locality are of the same color.

S. insonus, the only member of this group living north of Tehuantepec, on the west coast of Mexico, is restricted to the pine and oak forests in a limited area on the mountains of Guerrero.

There is a striking double parallelism in the curious resemblance in both form and color between the two representatives of this group in Mexico (*S. g. truei* and *S. insonus*) and the two swamp rabbits of the United States, *S. palustris* and *S. aquaticus*. *S. g. truei* of the humid tropical forests of southern Mexico, in its rich dark colors, short ears, short, slender hind feet, and short tail, is remarkably like *S. palustris* of the United States. On the other hand, *S. insonus* of southwestern Mexico bears an equally close superficial resemblance to *S. aquaticus* of the United States. The well-marked differences in the tails, which distinguish the two swamp rabbits of the United States, are practically the same in the corresponding Mexican wood rabbits. With our present material it is difficult to decide whether these remarkable resemblances point to a common origin, or merely represent parallel development. If the resemblances mean close relationship, then the North American species of the subgenus *Tapeti* must be arranged in two groups, one of which would include *gabbi* and *palustris* and the other *insonus* and *aquaticus*.

Average measurements of the Sylvilagus gabbi group.

	No. of specimens averaged.	Skin.				Skull.							Origin of specimens averaged.
		Total length.	Tail vertebræ.	Hind foot.	Ear from notch, in dried skin.	Basilar length.	Length of nasals.	Breadth of rostrum above premolars.	Depth of rostrum in front of premolars.	Interorbital breadth.	Parietal breadth.	Diameter of bullæ.	
Sylvilagus gabbi	1	....	....	....	39.0	55.2	28.3	17.0	14.3	15.0	25.0	8.5	Type (Costa Rica).
Sylvilagus gabbi	5	886	20.6	77.0	44.0	54.7	28.2	17.9	13.1	16.4	24.2	8.9	Panama.
Sylvilagus gabbi incitatus.	1	420	20.0	80.0	42.0	56.0	31.7	20.5	13.5	16.0	23.5	9.0	San Miguel Island, Panama.
Sylvilagus gabbi truei	5	382	20.8	77.0	45.6	54.4	30.4	18.3	14.8	16.4	25.6	9.7	Vera Cruz, Mexico.
Sylvilagus insonus	2	485	42.5	94.5	60.9	58.1	31.7	19.5	15.5	17.6	27.8	9.1	Guerrero, Mexico.

SYLVILAGUS GABBI (ALLEN).

COSTA RICA FOREST RABBIT.

(Pl. XII, figs. 2, 5.)

Lepus brasiliensis var. *gabbi* Allen, Mon. N. Am. Rodentia, pp. 349–350, August, 1877. Type from Talamanca, Costa Rica; No. $\frac{11871}{37794}$, ♂ ad., U. S. National Museum; collected by Jose C. Zeledon.

Lepus gabbi tumacus Allen, Bull. Am. Mus. Nat. Hist., N. Y., XXIV, p. 649, October 13, 1908. Type from Tuma, Nicaragua; No. 28409, ♂ ad., American Museum Natural History; collected by W. B. Richardson, December 2, 1907.

Geographic distribution.—Eastern Honduras, Nicaragua, Costa Rica, and Panama. Vertical range from sea level up to about 5,000 feet in Costa Rica; zonal range, Humid Tropical.

General characters.—Size, small; upperparts of body mainly dark buffy brown, shading back on rump and tail into nearly uniform reddish or rusty brown; ears short and rounded; tail very short and small; general appearance much like the Florida swamp rabbit (*S. palustris paludicola*).

Color in winter pelage.—Top of head deep ochraceous rufous, heavily washed with black; sides of nose and broad line through eye (forming a large supra- and postocular spot) dull grayish buffy; back varying from rich, deep ochraceous buff to nearly ochraceous rufous heavily overlaid with black (in worn pelage the ground color bleaches to dull cream buff); sides of body paler, more grayish buff than back and much less heavily washed with black; rump, top of tail, and back of hind legs nearly uniform reddish brown (nearly hazel of Ridgway), increasing in intensity from top of rump downward to bright rich cinnamon rufous on tops and sides of hind feet; underside of tail similar to but duller than upperside; nape rusty rufous; fore feet and legs similar to hind feet, but rather darker or duller rufous; underside of neck like sides of body; rest of underparts white; ears dusky brown on basal part and blackish on terminal half or two-thirds. In faded or worn pelage, much of the black wash on back wears off and ground color bleaches to dull cream or pinkish buff; rump and tail become dull reddish brown, and hind legs deeper more rusty brown, shading on feet into pale cinnamon rufous or deep creamy buff.

Juvenal pelage (from Nicaragua).—Upperparts dark russet brown shaded with black (duller and browner than the young of *truei*), but top of head slightly more reddish than back; ears blackish; nape dark dingy rusty; tops of fore and hind feet slightly rusty, cinnamon brown.

Skull.—Proportionately narrow; rostrum heavy, broader at base than interorbital width; upper outline of skull arched from occiput to tip of nasals, but depressed or somewhat flattened on frontal region; top of rostrum generally strongly arched, especially on terminal third; supraorbital process broadly joined to frontals, and anterior notch either lacking or very small; postorbital process small and short, and posterior end usually touching a small process on skull, thus inclosing a small flattened-oval foramen, but sometimes united with frontals along entire inner border and thus closing the foramen; braincase rather small and strongly arched posteriorly; interpterygoid fossa broad and deep; molar series heavy; bullæ remarkably small and flattened laterally; basioccipital between bullæ broad and flattened and not strongly constricted posteriorly (next condyles);

zygomatic arch heavy and angular, with no well-defined groove nor pit on outer surface, but usually roughly sculptured on jugal.

Average measurements (*5 adults*).—Total length, 386; tail vertebræ, 20.6; hind foot, 77; ear from notch in dried skin, 44.

Remarks.—Externally many adult specimens of *gabbi* from Panama, and *truei* are practically indistinguishable, except that the top of the head and nape of *gabbi* are rather brighter reddish than in *truei*, and some specimens of *truei* have larger ears than any specimens seen of *gabbi*. The young of *gabbi* from Honduras and Costa Rica, compared with those of *truei*, are readily distinguishable by their darker and duller colors and by the slightly more woolly character of the pelage.

The skull of the type of *gabbi* from Costa Rica has smaller bullæ and differs in other characters from the series from Panama. These differences may be purely individual, or may indicate that the Panama specimens represent a recognizable form. This can be determined only when a series from Costa Rica is available for comparison.

Although the rabbits of this species are not uncommon in much of their range, their scarcity in collections from Mexico and Central America testifies to their retiring habits. At the same time the natural exuberance of vegetation in their haunts aids greatly in concealing them.

Sylvilagus gabbi tumacus Allen is typical *gabbi* in rich unworn pelage with the characteristic small ears, small bullæ, and small light skulls.

Total number of specimens examined 20, from:

Panama: Panama City, 1; Bouqueron (Chiriqui), 5.
Costa Rica: Rancho Juan Viñas, 1; Rancho de Rio Jimenez (Irazu), 2; San José, 2; Talamanca, 3.
Nicaragua: Escondido River (50 miles from Bluefields), 1; Matagalpa, 2; Ocotal, 1; Tuma, 1.
Honduras: San Pedro Sula, 1.

SYLVILAGUS GABBI INCITATUS (BANGS).

SAN MIGUEL ISLAND RABBIT.

Lepus (*Tapeti*) *incitatus* Bangs, Am. Naturalist, XXXV, pp. 633–635, fig. A in text, August 22, 1901. Type from San Miguel Island, Bay of Panama, No. 8441, ♀ ad., Museum of Comparative Zoology (Bangs collection); collected by W. W. Brown, jr., April 30, 1900.

Geographic distribution.—San Miguel Island, Bay of Panama. Vertical range near sea level; zonal distribution Humid Tropical.

General characters.—Color of worn specimens as in *gabbi*, but size larger, with shorter ears; smaller and narrower braincase and heavier rostrum.

Color in worn pelage.—Top of head ochraceous rufous with black wash; most of upperparts pale dull ochraceous buff, strongly washed with black; sides of body with very little black wash and paler and more creamy buff than back; color of back shading on rump into pale cinnamon rufous or deep ochraceous buff, becoming dull reddish brown on tail and back of hind legs; ears reddish brown on basal half and blackish on terminal half; underside of neck like sides of body; rest of underparts white.

Skull.—In general resembles *gabbi*, but with interorbital width and braincase narrower and rostrum even heavier than in average *truei;* supraorbital process as in *gabbi*, but postorbital process even shorter and posteriorly touching a well-marked process on skull, thus inclosing a very small oval foramen.

Measurements (1 adult).—Total length, 420; tail vertebræ, 20; hind foot, 80; ear from notch in dried skin, 42.

Remarks.—This rabbit is so close to *gabbi* of the adjacent mainland that it seems best, notwithstanding its insular habitat, to treat it as a subspecies. The only known specimens are in worn and faded pelage and scarcely distinguishable in color from specimens of *gabbi* in similar condition from the mainland.

Total number of specimens examined 1, from:

Panama: San Miguel Island, 1.

SYLVILAGUS GABBI TRUEI (ALLEN).

VERA CRUZ FOREST RABBIT.

Lepus truei Allen, Bull. Am. Mus. Nat. Hist. N. Y., III, p. 192, December 10, 1890. Type from Mirador, Vera Cruz, Mexico; No. $\frac{6857}{15953}$, U. S. National Museum; collected by C. Sartorius.

Geographic distribution.—Heavily forested mountain slopes and adjacent coastal plain of eastern Mexico from eastern Puebla, Vera Cruz, northern Oaxaca, Tabasco, Campeche, Yucatan, interior and Pacific coast of Chiapas, and both coasts of Guatemala. Vertical range from a little above sea level to about 5,000 feet in Vera Cruz, Mexico; zonal range Humid Tropical.

General characters.—Size small; color of upperparts rich dark buffy washed with black; pelage coarse; ears small; tail small, short, and nearly same color above and below. Closely resembles *gabbi*, but differs in having colors duller, ears larger, skull more heavily proportioned, and bullæ larger; like *gabbi*, when in faded pelage, closely resembles *S. palustris paludicola.*

Color in fresh winter pelage.—Top of head rusty reddish, more or less washed with black; orbital area and sides of nose dingy buff slightly washed with black; cheeks darker buff with heavier wash of black; nape dark rusty rufous; outside of ears blackish brown, becoming blackish along anterior border and about tip; back and sides of body deep buffy, becoming more or less dark ochraceous buffy along back and paler on sides, with a heavy wash of black, especially on back; front of legs and tops of feet dull rusty; underside of neck dull brownish buffy; rest of underparts white.

Juvenal pelage.—Upperparts very dark, nearly uniform ochraceous buffy, heavily overlaid with black, but top of head a little more reddish and ears black; nape dull hazel; tops of hind feet bright cinnamon rufous; fore feet nearly the same, but paler.

Skull.—Similar to *gabbi*, but proportionately broader and heavier, with longer nasals, heavier rostrum, broader braincase, and larger bullæ; zygomatic arch, especially jugal, usually broader and more flattened. It has a marked general resemblance in form and proportions to the much larger skull of *S. floridanus yucatanicus.* Rostrum broad and rather flattened posteriorly, giving a massive appearance to base of rostrum and frontal region; nasals depressed toward tip, giving rostrum a decurved upper outline; supraorbital process completely ankylosed to skull anteriorly, or with very small notch; postorbital process with tip always joined to skull posteriorly, sometimes inclosing a flattened oval foramen and sometimes joined to skull along entire length, thus closing foramen; braincase depressed; jugals broad and heavy with or without a groove and deep pit at anterior end; molars proportionately heavy; bullæ small.

Average measurements (*5 adults*).—Total length, 382; tail vertebræ, 20.8; hind foot, 77; ear from notch in dried skin, 45.6.

Remarks.—This is a humid tropical species living in heavy undergrowth, where it makes well-marked runways. North of the Isthmus of Tehuantepec these rabbits inhabit only the gulf or east side of the continent. South of the isthmus they spread across and occupy suitable forest growths on both coasts. Its close superficial resemblance to *S. p. palustris* caused the first specimen of *truei* (which afterwards became the type) sent from Mirador, Vera Cruz, to be identified as that species, and thus made an erroneous Mexican record for the eastern swamp rabbit, which never occurs west of the Mississippi River.

In fresh pelage the general colors are richly shaded with deep ochraceous buff, but in worn or faded condition this becomes much paler or more grayish. The two most richly colored specimens in our series are from widely separated localities. One was collected February 28, 1898, on the gulf side of Mexico, at Metlaltoyuca, Puebla, and the other March 2, 1896, on the Pacific coast, at Huehuetan, Chiapas, near the border of Guatemala.

Total number of specimens examined 15, from:

Puebla (Mexico): Metlaltoyuca, 4.
Vera Cruz (Mexico): Buena Vista, 1; Mirador, 1; Motzorongo, 1; Otatitlan, 1.
Oaxaca (Mexico): Santo Domingo, 2.
Tabasco (Mexico): Teapa, 2.
Chiapas (Mexico): Huehuetan, 2; Ocuilapa, 1.

SYLVILAGUS INSONUS (NELSON).

OMILTEME RABBIT.

(Pl. XII, fig. 7.)

Lepus insonus Nelson, Proc. Biol. Soc. Washington, XVII, pp. 103–104, May 18, 1904. Type from Omilteme, Guerrero, Mexico, No. 126878, ♀ ad., U. S. National Museum (Biological Survey collection); collected by E. W. Nelson and E. A. Goldman, May 20, 1903.

Geographic distribution.—Heavily forested parts of Sierra Madre del Sur, Guerrero. Vertical range from about 7,000 to 10,000 feet; zonal range Upper Sonoran and Transition zones.

General characters.—In general appearance much like *S. aquaticus;* upperparts nearly uniform dark buffy brown; ears much larger and grayer than in *truei;* tail short and brown; tops of feet white.

Color in rather faded pelage.—Top of head and back tawny brown, heavily washed with black, shading on sides of head, body, and rump into a paler or grayer buffy with a lighter wash of black; sides of nose and orbital area dull grayish buffy; nape dull rusty rufous; outside of ears grizzled blackish brown, becoming blackish along anterior border and at tip; tail above dull rusty brown, below dingy buffy; underside of head and body dingy white; underside of neck a little more tawny than flanks; tops of fore feet and underside of fore legs dingy grayish white; front and sides of fore legs dull tawny or tawny ochraceous; front of hind legs and tops of feet dingy whitish; rest of hind legs like sides of body, but with a tawny ochraceous wash most marked on heels and sides of feet; soles of hind feet smoky brown.

Skull.—Much like that of *truei*, but more arched over posterior part of frontal region; supraorbital process much smaller and lighter, with a distinct notch between anterior end and skull; postorbital process small and light, touching skull at posterior tip and inclosing a small foramen; rostrum heavy and unusually deep at base; molar series lighter than in *truei*, and zygomatic arch heavier and broader without a well-marked groove, but with a shallow pit anteriorly; braincase and bullæ as in *truei;* interpterygoid fossa narrower.

Average measurments (2 adults).—Total length, 435; tail vertebræ, 42.5; hind foot, 94.5; ear from notch in dried skin, 60.9.

Remarks.—Although differing from *gabbi* and *truei* in its larger ears and longer tail, *insonus* has the coarse pelage, proportionately small feet, and characteristic skull of *Tapeti*. Its peculiar brownish color and large ears give it a curious superficial resemblance to *S. aquaticus*, but the skull is more like that of *S. g. truei*. *S. insonus*, like *truei*, lives in dense undergrowth, makes runways, and often occupies burrows under rocks or similar shelter. So far as known, it is limited to the heavily wooded summit of the Sierra Madre del Sur in Guerrero.

Total number of specimens examined 2, from:

Guerrero (Mexico): Omilteme, 2.

SYLVILAGUS PALUSTRIS Group (Subgenus TAPETI).

THE SWAMP RABBITS.

The swamp rabbits form a closely related group of two species, each with a single subspecies, as follows: *Sylvilagus palustris* and *S. p. paludicola*, with *Sylvilagus aquaticus* and *S. a. littoralis*. They are limited to damp or swampy wooded lowlands and marshes of the southeastern United States, and range from near San Antonio, middle southern Texas, and middle southern Oklahoma easterly along the Gulf and Atlantic coasts to Dismal Swamp in southern Virginia, and up river bottoms of the interior to above the junction of the Ohio and Mississippi (see fig. 17). The members of this group present so many peculiar characteristics and differ so much in habits from the other rabbits of the United States that they have long been treated as a distinct group of subgeneric, and even of generic, rank. It appears, however, that they belong to the same subgeneric group as the wood rabbits of tropical America, which Gray, in 1867, separated from other American rabbits under the generic name *Tapeti*. The relations of the swamp rabbits to the tropical wood rabbits are explained in the description of the subgenus *Tapeti* and in the remarks under the *S. gabbi* group.

The relationships of the single subspecies each of *palustris* and *aquaticus* to the typical forms are curiously alike. *S. palustris* has a smaller and much darker and more reddish subspecies, *paludicola*, inhabiting the coastal lowlands south of its range, just as *aquaticus* has a smaller and darker reddish form, *littoralis*, in the coastal marshes south of its range.

For many years the ranges of *Sylvilagus palustris* and *S. aquaticus* have been given as overlapping over a broad area extending from Alabama to Texas and north to Illinois. The fine series of both species now available from almost all parts of their ranges prove this to be erroneous. The borders of the ranges of the two species have been located along a narrow belt in western Georgia and eastern Alabama without the discovery of a single locality where they overlap. *S. palustris* extends along the Gulf coast to Mobile Bay, Alabama, but elsewhere has not been found west of Georgia. *S. aquaticus* ranges east to southwestern Georgia. The uncertainty that has existed in regard to the ranges of these species is shown by published records for them from as far south as Vera Cruz and Yucatan, Mexico, whereas in fact neither species reaches so far south as the mouth of the Rio Grande in Texas.

To the natives of central Georgia *S. palustris* is known as Pontoon. It is a short-legged species which depends largely on doubling and turning to escape the dogs, and is easily run down. On the other hand *S. aquaticus*, called cane-cutter in Alabama and western Georgia, has longer legs and bears the reputation of being a strong runner; it usually gives the dogs a hard run and often escapes. The best accounts of the extraordinary habits of both *S. palustris* and *S. aquaticus* are given by Bachman.

Average measurements of the Sylvilagus palustris group.

	No. of specimens averaged.	Skin.				Skull.							Origin of specimens averaged.
		Total length.	Tail vertebræ.	Hind foot.	Ear from notch, in dried skin.	Basilar length.	Length of nasals.	Breadth of rostrum above premolars.	Depth of rostrum in front of premolars.	Interorbital breadth.	Parietal breadth.	Diameter of bullæ.	
Sylvilagus palustris	5	436	33.0	91	52.0	63.4	33.3	21.5	16.4	18.4	27.0	11.6	**Coast of Georgia.**
Sylvilagus palustris paludicola.	5	426	39.0	88	44.8	60.0	30.3	19.7	16.2	17.4	26.0	12.0	Kissimmee, Florida.
Sylvilagus aquaticus	5	534	69.0	106	66.7	68.3	36.5	24.3	18.7	19.1	29.3	11.4	Alabama.
Sylvilagus aquaticus littoralis.	5	538	69.7	106	63.5	66.5	36.4	23.7	18.2	19.7	28.5	11.7	**Southern Louisiana and Mississippi.**

SYLVILAGUS PALUSTRIS (BACHMAN).

MARSH RABBIT.

(Pl. XII, figs. 3, 6.)

Lepus palustris Bachman, Journ. Acad. Nat. Sci. Philadelphia, VII, pt. 2, pp. 194–199, 1837. No definite type; described from specimens obtained near the coast of South Carolina.

Geographic distribution.—Lowlands along rivers and coast of southeastern States from Dismal Swamp, Virginia, south to extreme northern Florida, and west through most of southern Georgia and the Gulf coast of northwestern Florida to east side of Mobile Bay, Alabama. Vertical range from sea level to an undetermined altitude (probably less than 500 feet); zonal range Lower Austral.

General characters.—Size smaller than *S. aquaticus* and about equaling the Florida cottontail; feet small, slender, dark reddish ochraceous buff; general color often scarcely distinguishable from typical *S. aquaticus* except by dingy color of underside of tail; ears rather short, broad; tail very small, brown above, dingy gray or brownish gray below; skull heavy, with supraorbitals joined to skull along greater part of (or entire) length of anterior and posterior processes.

Color in slightly faded winter pelage.—Upperparts, including top of head, warm dark reddish ochraceous brown; nape varying from dull dark cinnamon rufous to a dull pale shade of same; rump about base of tail, upperside of tail, and back of hind legs dull dark rusty reddish, or chestnut brown; underside of tail dingy gray, sometimes almost brownish gray, and never white as in *aquaticus;* lower flanks, sides of abdomen, and underside of neck nearly uniform dark, slightly brownish, ochraceous buff; inside of fore and hind legs and a broad band along middle of abdomen (covering from one-third to two-thirds the width of abdomen) usually white, clearest on inside of legs, but latter area sometimes strongly buffy similar to sides of body, and white area on abdomen often narrowed or washed by extension of same; underside of head grayish, due to the thin wash of white over slaty underfur; sides of head dark buffy brown, grayer or paler than upperparts; ears on both sides nearly uniform, slightly grayish buffy brown, similar to sides of head; tip of ear with a narrow blackish border (absent in some individuals); inside of ear sometimes narrowly edged with clear ochraceous buff.

In spring and summer much of the overlying black wash on upperparts wears away, the reddish suffusion largely disappears, and the colors fade to more of a dull grayish buffy.

Juvenal pelage (Carteret County, North Carolina, July 5, 1894).—Upperparts dull dark buffy brown, rather duller and less ochraceous than in adults; feet and legs duller and more rusty rufous; a smaller specimen from Dismal Swamp, Virginia, June 8, 1895, slightly paler and more buffy brown than the one described above, but darker and much duller colored than adults.

Skull.—Heavy; braincase comparatively short, broad, and rounded, especially when compared with *aquaticus;* compared with latter the broad braincase and rather lighter, more tapering, rostrum gives entire skull a more pointed form; posterior end of nasals broad and roughly truncated, or separated by a broad, deep, triangular or subquadrate notch; supraorbital process with anteorbital and postorbital processes on plane with frontal area and fused to skull along most of length, though a small notch usually present at extreme front end of anterior process, and a small narrow slit-like foramen usually separates middle of postorbital process from skull; broad tip of posterior process fused to skull as completely as in *aquaticus;* zygomatic arch very heavy, even heavier than in *aquaticus*, with jugal deeply grooved; upper outline of skull a long arch, the arch shorter and more accented over occipital region than in *aquaticus;* molar series heavy, proportionately about as in last-named species; palatal bridge heavy; postpalatal fossa broad; bullæ small and joined to broad, heavy basioccipital by a strong pedicel.

The skull of typical *palustris* differs from that of typical *aquaticus* mainly in its much smaller size, broader, shorter braincase, and more rapidly tapering form. In addition, the postorbital process is less completely fused to the skull in a majority of the individuals examined.

Average measurements (5 adults).—Total length, 436; tail vertebræ, 33; hind foot, 91; ear from notch in dried skin, 52.

Remarks.—The close color resemblance between typical *palustris* and typical *aquaticus* is remarkable for such distinct species, though the much larger size, longer ears, white underside to tail, and heavy skull of *aquaticus* render it easily recognizable. So far as the material now available shows, there is no evidence that the ranges of these two animals overlap. There is much greater superficial difference (aside from the form and color of the tail), both in color and proportions, between *S. palustris* and *S. p. paludicola* than appears at a casual glance between *palustris* and *aquaticus*, though close examination proves these last to be absolutely distinct species. Three adults and one young from Dismal Swamp, Virginia, are true *palustris* in all external characters of size, proportions, and color, but have even heavier skulls than typical specimens from farther south. Specimens from St. Marys, Ossabaw, Cumberland Island, and St. Catherine Island are about typical in color, but the skulls of those from St. Marys are smaller and lighter, with slenderer rostrum, than those from the coast. The marsh rabbits on Anastasia Island, near St. Augustine, Florida, are intermediates, but are referable to *palustris*, and probably mark the southern limit of this form along the east coast.

This species has been recorded from Alabama and thence west to the Mississippi and north to Illinois. I have yet to see a specimen of this species from as far west as Alabama, except on the Gulf coast just east of Mobile Bay, although it may possibly reach the eastern part of that State. Americus is the westernmost point in Georgia from which I have seen specimens.

Fall specimens in fresh pelage from the Gulf coast at Bon Secour, Alabama, are not typical of either *palustris* or *paludicola*, but from their size and general coloration are nearest *palustris*, to which I have referred them. Their size is that of *palustris*, but they are distinctly more dusky, with less rusty or rusty buffy suffusion on the upperparts, especially on the head and feet. Their ears are darker brown, with a strong black wash, and the head on the side of the nose and between the base of the ear and the eyes is dull, dark iron gray—darker and grayer than in *palustris* and more dusky even than in *paludicola.* The tops of the feet are darker and less reddish than in *paludicola* and are sometimes almost dusky brown. Four out of five fall specimens from Abbeville, Georgia, are very similar to those from Bon Secour, the other is paler and like typical *palustris.* Two specimens from Americus, Georgia, are typical *palustris.* These dark specimens perhaps represent intergradation between *palustris* and *paludicola.*

Total number of specimens examined 54, from:

Virginia: Dismal Swamp, 4.
North Carolina: Carteret County, 1; Fort Macon, 5.
South Carolina: Frogmore, 4; Georgetown, 1; Society Hill, 1; Summerville, 1.
Georgia: Abbeville, 5; Americus, 2; Cumberland Island, 4; Nashville, 1; Ossabow Island, 8; Riceboro, 2; St. Catherine Island, 1; St. Marys, 6; St. Simons Island, 1.
Florida: Anastasia Island, 3; Whitfield, 2.
Alabama: Bon Secour, 2.

SYLVILAGUS PALUSTRIS PALUDICOLA (MILLER AND BANGS).

FLORIDA MARSH RABBIT.

Lepus paludicola Miller and Bangs, Proc. Biol. Soc. Washington, IX, pp. 105–108, June 9, 1894. Type from Fort Island, near Crystal River, Citrus County, Florida; ♀ ad., Museum of Comparative Zoology (No. 145, Bangs collection) collected by F. L. Small, January 28, 1894.

Geographic distribution.—Peninsular Florida and adjacent coast islands, north along the east coast at least to San Mateo, and on the west side for an unknown distance northwest of the type locality, but probably some distance beyond the Suwanee River. Vertical range from sea level up to about 100 feet altitude; zonal range extreme Lower Austral and upper border of Humid Tropical Zone.

General characters.—The smallest, darkest, and most reddish brown of the marsh rabbits; ears very short, broad, and rounded.

Color in fresh winter pelage.—Upperparts, including top of head, dark reddish brown or dark ochraceous brown, shading on flanks and sides of abdomen into dark, slightly brownish, ochraceous buff, varying to a duller more brownish buffy; rump usually more rufous than rest of upperparts, and often, about base and on top of tail and on back of hind legs, becoming almost uniform dark rusty chestnut; underside of tail varies from dingy whitish to dull buffy or brownish gray; sides of head and ears slightly paler than back and distinctly more grayish; nape varying from rich dark cinnamon rufous to lighter, more rusty rufous; top, front, and sides of fore feet and legs, tops of hind feet, and outside of hind legs rich dark cinnamon rufous, a little darker than in *palustris;* underside of neck like lower part of flanks or a little paler buffy; underside of head dingy gray or grayish white; sides of abdomen dark brownish buff similar to lower flanks; middle of abdomen and inside of legs usually dull white, but often more or less covered by extensions of the buff area until in some specimens the abdomen becomes completely dark buff, only slightly paler than flanks; in some cases a band of buff extends across middle of abdomen, dividing the white into two irregular patches.

Worn spring and winter specimens bleach to a dull buffy brown, of a paler and more yellowish shade than in early winter.

Juvenal pelage (specimens taken March 23 to April 14).—Entire upperparts, including sides of head and body, ears, and top of tail nearly uniform very dark buffy brown, darker than the same pelage of *palustris*, and much darker and less ochraceous than the adults of *paludicola;* underside of neck dark dingy buff; underside of head, abdomen, and inside of legs dull slaty gray, more or less strongly washed with dark buff, similar to that on underside of neck.

Skull.—Practically indistinguishable from that of typical *palustris*, except for its smaller size and rather large bullæ.

Average measurements (*5 adults*).—Total length, 426; tail vertebræ, 39; hind foot, 88; ear from notch in dried skin, 44.8.

Remarks.—Specimens from Gainesville and Hibernia are intermediate in size and length of ears between *palustris* and *paludicola*, but their dark color places them with *paludicola.* A half-grown young in the Bangs collection taken in February at Micco, Florida, is entirely melanistic, the underfur being dark slate color and the overlying coat of long hairs glossy black.

Total number of specimens examined 63, from:

Florida: Belleair, 4; Canaveral, 2; Cape Sable, 1; Drayton Island, 1; Enterprise, 1; Flamingo, 1; Gainesville, 6; Hibernia, 1; Kissimmee, 5; Fort Kissimmee, 5; Kissimmee River, 1; Lake Kissimmee, 4; Lake Harney, 11; Little Marco, 1; Micco, 7; Mullet Lake, 1; San Mateo, 4; Suwanee River, 1; Tarpon Springs, 6.

SYLVILAGUS AQUATICUS (BACHMAN).

SWAMP RABBIT.

Lepus aquaticus Bachman, Jour. Acad. Nat. Sci. Philadelphia, VII, pt. 2, pp. 319–326, pl. XXII, fig. 2, 1837. No definite type; described from specimens obtained in western Alabama by Dr. J. M. Lee.

? *Lepus douglasii* Gray, Mag. Nat. Hist. (Charlesworth), I, p. 586, 1837. Two cotypes in British Museum, said to have been collected in California or Texas by David Douglas.

Lepus aquaticus attwateri Allen, Bull. Am. Mus. Nat. Hist., New York, VII, Art. X, pp. 327–328 (author's separates issued November 8, 1895). Type from Medina River, 18 miles south of San Antonio, Texas; No. $\frac{7744}{8131}$, ♀ ad., American Museum of Natural History; collected by H. P. Attwater, May 8, 1894.

Lepus telmalemonus Elliot, Field Col. Mus., Zool. series, I, No. 15, pp. 285–287, May 24, 1899. Type from Washita River, near Dougherty, Indian Territory [Oklahoma]; in Field Museum of Natural History; collected by T. Surber, April, 1899.

Geographic distribution.—River bottoms and swampy woods from Lumpkin, southwestern Georgia, west to Medina River near San Antonio, middle Texas, and north at least to Hartshorne, Oklahoma, and to wooded bottoms of Ohio and Mississippi rivers in southern Illinois; but separated from Gulf coast by a narrow belt occupied by *littoralis.* Vertical range from a little above sea level to about 800 feet in Alabama, entirely in the Lower Austral Zone.

General characters.—Size and proportions similar to those of *littoralis*, but color of upperparts much paler and more grayish brown, lacking most of the reddish suffusion; back more conspicuously washed with black; skull a little heavier; general appearance much like that of *palustris*, but at once recognizable by the longer tail with its underside entirely pure white.

Color of adults in fresh pelage.—Top of head ochraceous buffy brown; back buffy grayish brown with a more or less marked shade of buffy, often becoming dull, rather pale, rusty brown; rump and upperside of tail and back of hind legs varying to dull ochraceous brown or sometimes reddish brown; sides of head, shoulders, flanks, and sides of abdomen paler and grayer than back, owing to shading out of the buffy suffusion and the less strongly marked black wash; tops, front, and outside of fore feet and legs, and tops and outside of hind feet and legs, cinnamon rufous, paler than in *littoralis;* outside of ears more brownish than sides of body, and approaching color of top of head; underside of neck dull buffy grayish similar to lower border of flanks; rest of lowerparts, including underside of tail and inside of legs, pure white.

Postjuvenal pelage (Red Oak, Oklahoma, September 13, 1892).—Similar to young of *littoralis* at same age, but distinctly paler and more grayish buffy brown; sides of head and shoulders much grayer.

Skull.—Averaging a little larger than in *littoralis*, otherwise the same.

The skull of the type of *attwateri* is that of an unusually large old adult, and is not equaled in size by any other I have seen.

Average measurements (*5 adults*).—Total length, 534; length of tail, 69; hind foot, 106; ear from notch in dried skin, 66.7.

Remarks.—The type specimens of the present species were sent Bachman by Dr. J. M. Lee and Capt. Benjamin Logan, of Alabama.

No definite type locality is mentioned, but the context appears to indicate that these specimens came from western Alabama, which may be considered the type region. The types do not appear to have been preserved, although Bachman, in Quadrupeds of North America, mentions a specimen from the Alabama River which he presented to the Philadelphia Academy of Sciences, but this is no longer in existence. So far as I can learn, not a specimen of *aquaticus* from Alabama has been available for comparison from near the time of Bachman until the summer of 1908, when A. H. Howell sent the Biological Survey a series from various parts of the State. These specimens, with others obtained from Alabama since Howell's visit, prove to be absolutely indistinguishable in size and color from others taken in middle and northern Mississippi and Louisiana, from southern Illinois, the eastern half of Texas, and of Oklahoma. From this it follows that *attwateri* and *telmalemonus* are synonyms of *aquaticus*. The darker and more rufous form, which has been considered to represent true *aquaticus* proves to be an unnamed subspecies not known to occur in Alabama and strictly confined to a narrow belt along the Gulf coast from Mississippi to Texas.

Lepus douglasii Gray was based on two specimens, which he designated var. 1 and var. 2, and gave their doubtful origin as California or Texas. The original description was entirely inadequate to place these animals definitely, though they appear to be swamp or marsh rabbits, and the statement that the underside of the tail was white would refer them to *aquaticus*. Waterhouse, in his Natural History of the Mammalia (II, pp. 112, 119), states that Bachman examined the type of Gray's var. 1 and recognized it as the same as his *aquaticus;* Waterhouse identifies var. 2 as *palustris*. The exact status of *douglasii* appears to be still unsettled.

As in other rabbits, the present species shows considerable seasonal as well as individual variation in color. In fresh pelage the colors are dark and rich, but with wear and fading become paler and grayer on the upperparts of the body and paler rufous or rusty on the legs.

Specimens from near the border line of *littoralis*, as at Columbia and Sourlake, Texas, show a distinct increase of rusty on the entire upperparts. One of the two specimens from Columbia is unmistakably *aquaticus*, while the other is scarcely distinguishable from *littoralis*.

Three good specimens in the Field Museum from the Ohio and Mississippi River bottomlands of extreme southern Illinois are typical *aquaticus*. A male and a female from Olive Branch, Illinois, collected in November and in perfect winter pelage, have the upperparts pale grayish buffy heavily overlaid with black and the rump, top of the tail, hind legs, and feet dull rusty, exactly duplicating the colors of specimens in similar condition from Oklahoma, Texas, Louisiana, and Alabama. The third Illinois specimen, taken at Reevesville, April 17, has lost most of the black wash, and the upperparts are pale grayish, a little more rusty on rump and top of tail, and is almost an exact duplicate of a specimen taken at Victoria, Texas, April 3.

J. D. Mitchell of Victoria, Texas, informs me that the nesting habits of this swamp rabbit are identical with those of the cottontail (*S. f. chapmani*), except that the nest is considerably larger and is placed in dry places in river bottoms near a fallen log, dead stump, or pile of trash. He states further that the young, as in the case of the cottontail, are born naked, blind, and helpless.

Bachman says that *aquaticus* usually prefers swampy lowlands, but sometimes occurs in heavily wooded uplands. E. A. Preble found them in Oklahoma, living in dry bottomlands covered with a heavy growth of oaks and other deciduous trees, where there was comparatively little undergrowth.

Total number of specimens examined 68, from:

Georgia: Lumpkin, 1.
Alabama: Auburn, 6; Castleberry, 5; Coosa River (50 miles below Rome), 1; Covington, 3; Greensboro, 1; Huntsville, 3; Reform, 5.
Mississippi: Garlandsville, 1; Warren County, 2.
Louisiana: Cartville, 2; Clarks, 1; Haughton, 1; Prairie Mer Rouge, 4.
Texas: Antioch, 1; Columbia, 2; Cook County, 1; Gurley, 2; Joaquin, 1; Medina River (18 miles southwest of San Antonio), 6; Richmond, 1; Sourlake, 4; Troup, 1; Victoria, 1.
Oklahoma: Hartshorne, 1; Red Oak, 3.
Missouri: Cushion Lake, 1; St. Francis River (west of Senath), 1.
Illinois: Olive Branch, 4; Reevesville, 1.
Tennessee: Samburg, 1.

SYLVILAGUS AQUATICUS LITTORALIS SUBSP. NOV.

COAST SWAMP RABBIT.

Type from Houma, Louisiana; No. [illegible], ♀ ad., U. S. National Museum (Biological Survey collection); collected by Vernon Bailey, May 4, 1892.

Geographic distribution.—A narrow belt of swamps and marshes along the Gulf coast, nearly if not entirely within upper limits of tidewater, from Bay St. Louis, Mississippi, west through Louisiana to Matagorda Bay, Texas. Vertical range below 50 feet altitude, wholly within the Lower Austral Zone.

General characters.—Size about as in *aquaticus*, but color much darker and more reddish, especially on rump, hind legs, and tops of all the feet.

Color in fresh winter pelage.—Upperparts, including top of head, dark rusty or reddish brown strongly washed with black, and becoming distinctly more rufous (nearly chestnut) on lower rump, top of tail, and back of hind legs; nape dark rich cinnamon rufous; lower flanks and sides of abdomen dull ochraceous buff, more brownish on flanks and clearer on sides of abdomen; underside of neck usually like sides of abdomen, sometimes varying from deep ochraceous buff to bright rich tawny ochraceous of Ridgway; inside of legs and broad band along middle of abdomen usually white, but inside of legs sometimes ochraceous buff and a wash of same over most of abdomen; outside of ears dusky reddish brown with a narrow black edging about tip; inside of ears gray, becoming brown along posterior edges; ocular area deep rusty buff; sides of head below eyes brownish gray, paler and grayer than sides of body, and less washed with black than back; top of fore feet and front and outside of fore legs deep rich cinnamon rufous; top and outside of hind feet and legs similar but a little paler.

In spring and summer the black wash on the back wears away and the reddish tinge fades until the color of the upperparts becomes distinctly paler brown, with a grayer cast on the sides, especially on shoulders.

Postjuvenal pelage (Houma, Louisiana, May 13, 1892).—Upperparts of body dull dark buffy brown, much duller and with only a trace of the reddish suffusion so characteristic of the adults; top of head nearly as in adult; nape dull dark cinnamon rufous; top of tail dull rusty brown; back of hind legs similar but more rusty; outside of hind legs and tops of hind feet rusty cinnamon; fore feet with front and sides of fore legs similar but darker; underside of neck buffy brown (near wood brown of Ridgway) and nearly like sides of body.

Skull.—Proportionately long and narrow, but strongly, almost massively, built; braincase narrow and drawn out posteriorly; rostrum long and heavy; nasals separated posteriorly by a broad deep roughly triangular or quadrate notch, and posterior ends usually truncated; supraorbitals heavy, with anteorbital and postorbital processes usually completely united with the skull, giving the frontal area a flattened appearance; interorbital breadth much less than width of rostrum at base, thus helping give skull its oblong and but slightly tapering form; zygomatic arch heavy and compressed along side of skull; jugal heavy and deeply grooved, but without a well-marked pit anteriorly; upper outline of skull a long curve, only slightly more strongly decurved over occiput than over rostrum; molar series broad and heavy; palatal bridge broad; postpalatal fossa broad and deep; bullæ small and connected with broad heavy basioccipital by a broad pedicel; underside of skull strong and massive.

Measurements of type.—Total length, 523; tail vertebræ, 70; hind foot, 107; ear from notch in dried skin, 63.

Average measurements (*5 adults*).—Total length, 538; tail vertebræ, 69.7; hind foot, 106; ear from notch in dried skin, 63.5.

Remarks.—As already stated under the notes on *aquaticus*, the present form has long been erroneously supposed to be true *aquaticus.* It has a very restricted range and appears to be typical only along a narrow coast belt. Specimens from so small a distance inland as Covington, Louisiana, and Sourlake and Richmond, Texas, although evidently intergrades, are nearer true *aquaticus* from the interior. Specimens from Perry, Louisiana, also are intermediate, but are nearer *littoralis.* The two forms intergrade only in a narrow belt just above the upper border of tidewater, and outside this the differentiation is strongly marked. The amount of differentiation between the two forms is remarkable, considering the small apparent difference in character of their ranges in southern Louisiana.

Total number of specimens examined 36, from:

Louisiana: Belair, 1; Burbridge, 4; Gibson, 4; Hackberry, 3; Houma, 2; Lake Catherine, 4; New Orleans, 1; Perry, 2; Powhatan Place (near Gibson), 7; Pointe Aux Loups Springs, 2.
Mississippi: Bay St. Louis, 2.
Texas: Austin Bayou, 1; Bernard Creek, 2; Matagorda, 1.

Genus BRACHYLAGUS Miller.

BRACHYLAGUS IDAHOENSIS (MERRIAM).

IDAHO PYGMY RABBIT.

(Pl. XIII, figs. 4, 5, 6.)

Lepus idahoensis Merriam, N. A. Fauna No. 5, pp. 75–78, 2 figs. in text, July 30, 1891. Type from Pahsimeroi Valley, Custer County, Idaho; No. $\frac{24046}{31411}$ ♂ ad., U. S. National Museum (Biological Survey collection); collected by V. Bailey and B. H. Dutcher, September 16, 1890.

Geographic distribution.—Sagebrush plains of southern Idaho, southeastern Oregon, extreme northeastern California, and northern and central Nevada (see fig. 18). Vertical range from about 4,500 to over 7,000 feet altitude in Nevada; zonal range mainly Upper Sonoran, but extending into the lower border of Transition Zone.

General characters.—Very small (total length about 300 mm.); ears short, broad, and woolly; tail very short and nearly unicolor; postjuvenal pelage in summer, brownish gray much like young specimens of *Sylvilagus nuttalli;* adults in fall drab or pinkish drab; feet ochraceous; skull short, very broad posteriorly; bullæ very large; rostrum short, pointed.

Color of adults in fresh winter pelage (3 September specimens examined).—Upperparts, including top of head, covered with extremely abundant, long, soft, almost silky, pelage varying from pinkish drab to écru drab of Ridgway, unlike the color of any other American rabbit; sides of head and body slightly grayer than back; the black wash on upperparts slight, much less marked than usual in other species; posterior half of ears and nape cinnamon buff, anterior half of ears similar to top of head, but near tip narrowly edged with black; inside of ears covered with long dingy whitish hairs and narrowly edged with dull buffy; top and sides of fore feet and legs deep cinnamon buff, slightly paler on top of feet; top and sides of hind feet similar to fore feet, but rather paler and sometimes becoming buffy whitish on top; upperside of tail similar to back, underside a little grayer and sometimes slightly more brownish; underside of neck buff; rest of underparts white.

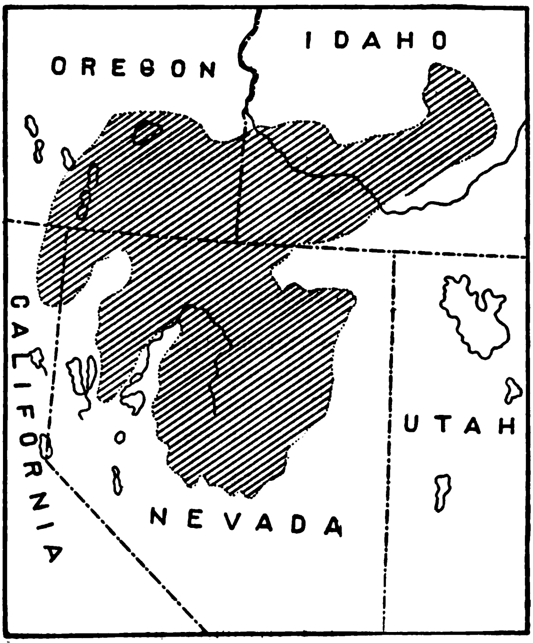

FIG. 18.—Distribution of the Idaho pigmy rabbit (*Brachylagus idahoensis*).

Worn spring pelage of adults.—In spring and summer, overlying parts of pelage much worn and faded, partly exposing underfur; general color of upperparts dull brownish gray; long soft hairs of the ears nearly gone, front half of ears then varying from pale gray to dusky according to amount of wear, and the feet and fore legs paler, more buffy. In this condition not differing much in color from several species of small cottontails in worn pelage, but to be at once distinguished by the very small nearly unicolored tail.

Juvenal pelage (12 specimens examined, all collected between May 14 and August 16).—Upperparts, including head and sides of body, nearly uniform dark brownish gray, sometimes rather light and sometimes darker, always with a slight suffusion of buffiness; feet and legs dark buffy; underside of body whitish, often washed with pale buffy; tail brownish on both sides; ears with long hairs on inside and with a whitish border; nape dingy buff or dull cinnamon; in this pelage color much like that of young *S. nuttalli.*

Fresh postjuvenal pelage (6 specimens examined, June 27 to August 1).—Upperparts including top of head dark, slightly buffy brownish gray; sides of head and body slightly paler; nape ochraceous buff; top and outside of hind feet and along front line of hind legs, also top and front of fore feet and legs, ochraceous buff; the buffy paler on hind feet and darker on fore feet and legs; both sides of tail buffy or rusty brownish contrasting with back; underside of neck buffy; rest of underparts white sometimes shaded with buff; posterior half of ears similar to but duller than nape, especially near tip, anterior half of ears dark gray more or less washed with dusky.

Skull.—Short, broad posteriorly, pointed, and sloping anteriorly, thus giving a strong superficial resemblance to the skulls of very young jack rabbits; braincase very broad and rounded, with enormous rounded bullæ, which add to apparent size of braincase; rostrum short, with base broad, deep, and tapering rapidly to the small pointed muzzle; interorbital breadth proportionately narrow; supraorbitals small and delicate, the anteorbital process usually present in adults, but sometimes completely lacking, leaving a shallow open concavity in front of base of supraorbital; postorbital process slender and rod like, usually free from skull (but rarely attached to skull along base), with the posterior tip free, except in old individuals, when it often touches the skull; in such specimens a rod-like anteorbital process almost eqnal in size and length to the postorbital extends forward and touches the skull, thus giving completely closed anteorbital and postorbital slit-like foramina of about same size; in young skulls supraorbitals much smaller and processes shorter and slenderer than in the adults; jugals in adults proportionately heavy with no well-marked groove or pit; upper outline of skull high arched over front of braincase and curving down abruptly over occiput; anteriorly the slightly curved slope descends rapidly from frontal region to tip of rostrum; basioccipital small, narrow, and trough-shaped; palatal bridge rather narrow, and interpterygoid fossa unusually broad and deep; lower outline of rami of lower jaw strongly convex, thus raising anterior end of rami free from plane on which jaw rests.

Average measurements of 5 adults from Idaho and northern Nevada.—Total length, 291; tail, 18.8; hind foot, 71; ear from notch, 41.3. Skull: Basilar length, 39.5; length of nasals, 19.2; breadth of rostrum above premolars, 14.2; depth of rostrum in front of premolars, 10.9; interorbital breadth, 12.3; parietal breadth, 23.4; diameter of bullæ, 11.7.

Remarks.—The present species, when in young or adult summer pelage, is not very different in general appearance from several of the small gray cottontails, though the short, broad ears lined with conspicuously long gray hairs and the short nearly unicolored tail render them easily separable. The summer pelage is covered with a decidedly heavier wash of black than appears in the winter pelage. In the winter pelage, however, the strange drab color of the upperparts with the broad woolly ears and ochraceous feet make a combination strikingly unlike any other American species. The type appears to be a young of the year changing into the adult winter pelage, but with the front part of the shoulders and top of the head still in the summer pelage.

The skulls from Idaho, Oregon, and northeastern California appear to be alike and differ from Nevada specimens in being slightly smaller. This difference is not strongly marked, and the lack of a proper series of adults from both areas renders it impossible to decide whether this difference is individual or geographic. This species is one of the rarest and least known of American rabbits, and much remains to be learned concerning its distribution and habits. Vernon Bailey has ascertained that it often digs its own burrows. It is the only American species known to do this. It has two annual molts like members of the subgenus *Lepus*.

The type and one other Idaho specimen collected respectively September 16 and 22, 1890, are in winter pelage which has just been assumed and is not quite completed in the type. Two specimens collected at Paradise, Nevada, January 16 and 28, 1909, are in faded winter pelage. A series of ten specimens collected at Paradise, Nevada, from March 1 to 9, 1908, are in full summer pelage as are others from Nevada collected in August. From the foregoing dates it appears that the winter pelage is assumed in September and lost not later than some time in February, while the summer pelage is assumed the last of February and is lost early in September, the winter pelage thus lasting about five and the summer pelage seven months. The winter pelage is lost at an earlier date than in any other American species of rabbit which has two annual molts.

Total number of specimens examined 44, from:

Idaho: Big Lost River Valley, 1; Birch Creek, 1; Junction, 1; Lost River Mountains, 1; Pahsimeroi Valley, 2.

Oregon: Catalow Valley, 2.

California: Goose Lake, 1.

Nevada: Halleck, 10; Ione Valley, 5; Monitor Valley, 2; Paradise, 12; Reese River (lat. 39° N.), 4; Skelton, 2.

Genus **ROMEROLAGUS** Merriam.

ROMEROLAGUS NELSONI Merriam.

Mexican Pygmy Rabbit.

(Pl. XIII, figs. 1, 2, 3.)

Romerolagus nelsoni **Merriam, Proc. Biol. Soc. Washington, X, pp. 173–174, fig. 33 in text, December 29, 1896. Type from 11,000 feet altitude on northwest slope Mount Popocatepetl, State of Mexico, Mexico; No. 57949, ♂ ad., U. S. National Museum (Biological Survey collection); collected by E. W. Nelson and E. A. Goldman, January 6, 1894.**

Geographic distribution.—Middle slopes of Popocatepetl and Iztaccihuatl, mainly on north and west sides, fronting Valley of Mexico (see fig. 19). Vertical range from about 10,000 to 12,000 feet; zonal range Canadian.

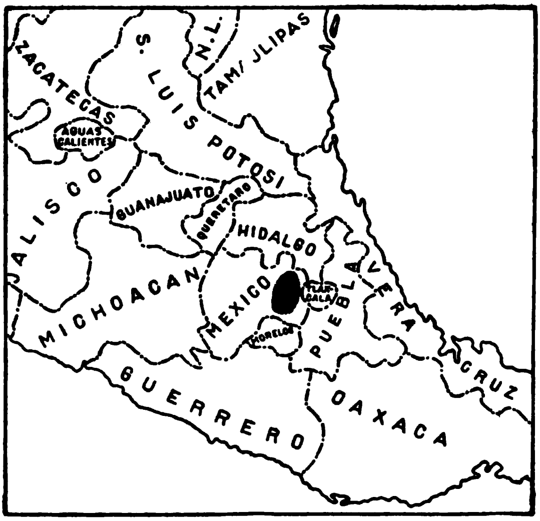

Fig. 19.—Distribution of the Mount Popocatepetl pigmy rabbit (*Romerolagus nelsoni*).

General characters.—Size very small; next to *B. idahoensis* smallest of American rabbits; upperparts dark brown; pelage soft and abundant; ears short and rounded; hind feet small and short; tail absent.

Color in fresh winter pelage.—Entire upperparts, including ears, legs, sides of head and body, nearly uniform dark grizzled buffy brown or dull cinnamon brown; feet, sides of nose, and orbital areas grayer; nape isabella color; underside of neck brownish gray; rest of underparts paler, dingy gray.

Measurements—Type.—Total length, 311; tail rudimentary; hind foot, 53. Averages of 3 adults: Total length, 303; tail rudimentary; hind foot, 52.3; length of ear from notch in dried skin averages 36, and from base 29 to 43.

Skull.—Has a general resemblance in form to typical *Sylvilagus* but approaches *Ochotona* in form of interorbital area and in the backward extension of jugal. Skull heavily ossified; rostrum rather long and pointed with straight outlines; zygomatic arch heavy, with posterior end of jugal extended nearly as in *Ochotona;* supraorbital processes broadly attached to frontals and much reduced in width; no anterior notch; postorbital process very small, short, and divergent, inclosing a shallow open notch; bony palate very long; interparietal distinct; bullæ proportionately large.

Skull measurements.

	Basilar length.	Length of nasals.	Breadth of rostrum above premolars.	Depth of rostrum in front of premolars.	Interorbital width.	Parietal breadth.	Diameter of bullæ.
Type No. 57949 (5639)	45.8	23.4	14.3	11.8	10.0	23.6	11.4
Average of 3 adults	45.2	23.4	14.3	11.4	10.1	22.8	10.9

Remarks.—In its short round ears and absence of tail this curious little rabbit bears an interesting external resemblance to the pikas (*Ochotona*). From its similarity in form, color, and texture of pelage, however, it appears even more like a gigantic short-bodied field mouse (*Microtus*). The resemblance to the latter is heightened by the mode of progression and the use of well-defined runways and tunnels, which form a network of roads among the dense growth of grass where the animals live. They are limited to a very restricted territory on the slopes of the two great volcanoes which rise side by side on the eastern border of the Valley of Mexico, and even there occur only in areas where a heavy growth of coarse sacaton grass affords shelter. Like field mice, they are mainly crepuscular and nocturnal, but sometimes move about in runways by day, especially in cloudy weather.

Total number of specimens examined 6, from:

Mexico (Mexico): Mount Popocatepetl, 6.

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The first American rabbit known to science was described by Erxleben in 1777, under the name *Lepus americanus.* At intervals thereafter a few others were described, but no general paper on the group was published until 1837, when Bachman recognized 7 species from North America.[a] This was followed two years later by a much more important paper from the same author, in which 14 species were ascribed to this continent, though one of these, *L. longicaudatus*, afterwards proved to be from Africa.[b] In 1848 Waterhouse recognized 13 species,[c] and a little later this number was reduced to 12 by Audubon and Bachman.[d]

By far the best account of the several species and their relationships published up to that date was by Baird in 1857, when he recognized 13 species and gave notes on various others.[a] Baird was the first to separate the rabbits of North America into sections or groups, of which he recognized five, designating them by letter.

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[a] Journ. Acad. Nat. Sci. Philadelphia, VII, pp. 282–361, 1837.

[b] Ibid., VIII, pp. 75–101, 1839.

[c] Nat. Hist. Mamm., II, pp. 101–145, 1848.

[d] Quadrupeds of North America, I, II, III, 1846–1854.

In 1867 Gray subdivided the genus *Lepus* into seven genera, of which three, *Hydrolagus*, *Sylvilagus*, and *Tapeti*, are peculiar to America, and the original genus *Lepus* is circumpolar.[b]

Ten years later Doctor Allen published his elaborate monograph of the North American Leporidæ, in which the number of species and varieties was raised to 18.

For a period of some years after the publication of the Allen and Coues monographs of North American Rodentia in 1877, American naturalists seemed to think that little was left to learn about American mammals, and I find only a single title to cite in the bibliography given below between 1877 and 1890. Toward the end of the eighties, however, the surprising results obtained by Doctor Merriam in the recently organized work of the Division of Economic Ornithology and Mammalogy, afterwards the Biological Survey, awakened naturalists to the remarkable possibilities in what proved to be the almost unknown field of American mammalogy. The important titles bearing on the Leporidæ of North America increased from 1 in the thirteen years from 1877 to 1889, inclusive, to 66 in the nineteen years between 1890 and 1908, inclusive. The number of recognized species and subspecies increased in the same period from 13 to 97.

The following tabular arrangement shows the species and subspecies recognized by the principal authors up to 1877:

List of species of American rabbits recognized in general papers on the group up to 1877.

Bachman, 1839. 14 species.	Waterhouse, 1848. 12 species.	Aud. & Bach., 1851–1854. 12 species.	Baird, 1857. 13 species.	Allen, 1877. 18 species and varieties.
L. glacialis	glacialis	glacialis	glacialis	var. arcticus
L. americanus	americanus	americanus	americanus	americanus
L. campestris	campestris		campestris	campestris
L. townsendii		townsendii		
L. californicus	californicus	californicus	californicus	californicus
L. richardsonii				
L. nigricaudatus	callotis	callotis	callotis	var. callotis
L. longicaudatus				
L. aquaticus	aquaticus	aquaticus	aquaticus	aquaticus
L. palustris	palustris	palustris	palustris	palustris
L. sylvaticus	sylvaticus	sylvaticus	sylvaticus	sylvaticus
L. nuttallii	nuttallii	nuttallii		nuttallii
L. artemisia	artemisiæ	artemisia	artemisia	
L. bachmani	bachmani	bachmani	bachmani	
	texianus	texianus		var. texianus
			trowbridgii	trowbridgei
			audubonii	var. auduboni
			washingtonii	var. washingtoni
				var. bairdi
				var. virginianus
				graysoni
				var. gabbi
				var. arizonæ

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[a] Mammals of North America, pp. 572–617, 1857.

[b] Ann. and Mag. Nat. Hist., ser. 3, XX, pp. 221–225, 1867.

In Doctor Allen's Monograph of the Rodentia, cited below, appears a résumé of the important literature bearing on this group up to and including 1875. I have brought up this bibliography from that time to include 1908, merely listing the most important papers.

1877. **Allen, J. A.** Monographs of North American Rodentia, II. *Leporidæ*, pp. 267–378. *Lepus sylvaticus* var. *arizonæ*, *L. brasiliensis* var. *gabbi*, and *L. graysoni* are first described here. Pages 277 to 281 contain a bibliographic résumé, extending from 1766 to 1875.

1884. **Merriam, C. Hart.** Mammals of the Adirondacks, pp. 305–311, September. Both *Lepus americanus* and *L. a. virginianus* are considered residents of the Adirondacks, the former limited to the higher elevations.

1890. **Mearns, E. A.** Descriptions of Supposed New Species and Subspecies of Mammals from Arizona. <Bull. Am. Mus. Nat. Hist., II, pp. 277–307, February. Contains original descriptions of *Lepus alleni* and *L. melanotis*.

1890. **Thomas, Oldfield.** On a Collection of Mammals from Central Vera Cruz, Mexico. <Proc. Zool. Soc. London, pp. 71–76, 2 pls., June 1. Contains the original description of *Lepus veræcrucis* (=*Sylvilagus cunicularius* Waterh.).

1890. **Merriam, C. Hart.** Mammals of the San Francisco Mountain Region. <N. A. Fauna No. 3, pp. 76–78, September 11. The characters distinguishing the Arizona cottontail from the eastern or *Sylvaticus* group of cottontails are set forth with figures of its head and skull.

1890. **Allen, J. A.** Descriptions of a New Species and a New Subspecies of the Genus *Lepus*. <Bull. Am. Mus. Nat. Hist., III, pp. 159–160, October. Original descriptions of *Lepus cinerascens* and *Lepus s. floridanus*.

1890. **Allen, J. A.** Notes on Collections of Mammals made in Central and Southern Mexico, by Dr. Audley C. Buller, with Descriptions of New Species of the Genera *Vespertilio*, *Sciurus*, and *Lepus*. <Bull. Am. Mus. Nat. Hist., III, pp. 175–194, December. Original descriptions of *Lepus insolitus* and *Lepus truei*.

1891. **Merriam, C. Hart.** Mammals of Idaho. <N. A. Fauna No. 5, pp. 75–78, July 30. Contains original description of *Lepus idahoensis* with notes on its habits.

1893. **Merriam, C. Hart.** Preliminary Description of Four New Mammals from Southern Mexico, collected by E. W. Nelson. <Proc. Biol. Soc. Washington, VIII, pp. 143–144, December 29. Contains original description of *Lepus orizabæ*.

1894. **Allen, J. A.** On the Seasonal Changes in the Varying Hare (*Lepus americanus* Erxl.). <Bull. Am. Mus. Nat. Hist., VI, pp. 107–128, May 7. A detailed account showing that the changes in color of pelage in this species are due entirely to molts which occur in spring and fall.

1894. **Allen, J. A.** On the Mammals of Aransas County, Texas, with Descriptions of New Forms of *Lepus* and *Oryzomys*. <Bull. Am. Mus. Nat. Hist., VI, pp. 165–198 (author's separates published May 31). Contains original description of *Lepus sylvaticus mearnsi*.

1894. **Miller, Gerrit S., Jr., and Bangs, Outram.** A New Rabbit from Western Florida. <Proc. Biol. Soc. Washington, IX, pp. 105–108, June 9. The original description of *Lepus paludicola*.

1894. **Allen**, J. A. Descriptions of Five New North American Mammals. <Bull. Am. Mus. Nat. Hist., VI, pp. 347–350 (author's separates published December 7). Contains original descriptions of *Lepus texianus eremicus* and *Lepus sylvaticus pinetis*.

1895. **Bangs, Outram.** The Geographical Distribution of the Eastern Races of the Cotton-tail (*Lepus sylvaticus* Bach.) with a description of a New Subspecies, and with Notes on the Distribution of the Northern Hare (*Lepus americanus* Erxl.) in the East. < Proc. Bost. Soc. Nat. Hist. for 1894, XXVI, pp. 404–414, 1895. Contains the original description of *Lepus sylvaticus transitionalis* (=*Sylvilagus transitionalis*) and interesting notes on distribution and habits.

1895. **Rhoads, Samuel** N. Notes on the Varying Hares of Washington and British Columbia with Description of a New Subspecies. <Proc. Acad. Nat. Sci. Philadelphia, pp. 241–243, June. Contains original description of *Lepus americanus columbiensis*.

1895. **Allen**, J. A. List of Mammals Collected in the Black Hills Region of South Dakota and in Western Kansas by Mr. Walter W. Granger, with Field Notes by the Collector. <Bull. Am. Mus. Nat. Hist.,' VII, pp. 259–274, August 21. Contains original description of *Lepus sylvaticus grangeri*.

1895. **Allen**, J. A. Descriptions of New American Mammals. <Bull. Am. Mus. Nat. Hist., VII, pp. 327–340 (author's separates published November 8). Contains original description of *Lepus aquaticus attwateri*.

1896. **Palmer**, T. S. The Jack Rabbits of the United States. Bull. No. 8, Division of Ornithology and Mammalogy, U. S. Dept. Agri., pp. 84, 6 pls., 2 text figs., February. An account of the habits and distribution of the jack rabbits in relation to agriculture, including notes on rabbit drives.

1896. **Rhoads, Samuel** N. The Polar Hares of Eastern North America, with Descriptions of New Forms. <American Naturalist, XXX, pp. 234–239, March. Original descriptions of *Lepus arcticus bangsii* and *L. grœnlandicus*.

1896. **Mearns, Edgar** A. Preliminary Diagnosis of New Mammals from the Mexican Boundary of the United States. Proc. U. S. National Museum, XVIII, pp. 443–447 (advance sheets published March 25, 1896). Contains original description of *Lepus merriami*.

1896. **Mearns, Edgar** A. Preliminary Description of a New Subgenus and Six New Species and Subspecies of Hares from the Mexican Border of the United States. <Proc. U. S. Nat. Mus., XVIII, No. 1081, pp. 551–565, June 24. Contains original descriptions of the subgenus *Macrotolagus* and of *Lepus sylvaticus holzneri*, *L. arizonæ major*, *L. arizonæ minor*, *L. gaillardi*, *L. texianus griseus*, and *L. texianus deserticola*.

1896. **Rhoads, Samuel** N. Synopsis of the Polar Hares of North America. <Proc. Acad. Nat. Sci. Philadelphia, pp. 351–376, 5 pls., August 4. A monographic revision of the American polar hares.

1896. **Bangs, Outram.** Some New Mammals from Indian Territory and Missouri. < Proc. Biol. Soc. Washington, X, pp. 135–138, December 28. Original description of *Lepus sylvaticus alacer*.

1896. **Merriam, C. Hart.** *Romerolagus nelsoni*, a New Genus and Species of Rabbit from Mount Popocatepetl, Mexico. < Proc. Biol. Soc. Washington, X, pp. 169–174, December 29. The first account of this curious mammal, with notes on its habits.

1897. **Mearns, Edgar A.** A New Subgeneric Name for the Water Hares (*Hydrolagus* Gray). < Science, N. S., V, No. 114, p. 393, March 5. *Limnolagus* is proposed to replace the preoccupied *Hydrolagus*.

1897. Editorial. A Remarkable Rodent. < Natural Science (London), X, No. 61, p. 151, March. A review of the original account of *Romerolagus nelsoni*, which claims it is the "same as the *Lepus diazi* in the catalog of the Mexican exhibit at the Chicago World's Fair."

1897. **Merriam, C. Hart.** *Lepus baileyi*, a New Cottontail Rabbit from Wyoming. < Proc. Biol. Soc. Washington, XI, pp. 147–148, June 9.

1897. **Trouessart, E. L.** Catalogus Mammalium tam viventium quam fossilium. New edition, October. The new subgenus *Microlagus*, based on *Lepus cinerascens* Allen, is first named here (p. 660), and 53 species and subspecies of North American rabbits are listed and ranges given.

1898. **Thomas, Oldfield.** On New Mammals from Western Mexico and Lower California. < Ann. and Mag. Nat. Hist., ser. 7, I, No. 1, pp. 40–46, January 1. Original description of *Lepus californicus xanti*.

1898. **Merriam, C. Hart.** Science, N. S., VII, No. 158, pp. 30–33, January 7. A review of a new edition of the Catalogus Mammalium, Trouessart, Parts II and III. The fact that *Lepus cinerascens* is probably a subspecies of *L. trowbridgeii* (=*bachmani*) is first stated in this review.

1898. **Bangs, Outram.** The Eastern Races of the American Varying Hare, with a description of a New Subspecies from Nova Scotia. < Proc. Biol. Soc. Washington, XII, pp. 77–82, March 24, contains original description of *L. americanus struthopus*.

1898. **Allen, J. A.** Descriptions of New Mammals from Western Mexico and Lower California. <Bull. Am. Mus. Nat. Hist., X, pp. 143–158, April 12. Contains original descriptions of *Lepus peninsularis*, *Lepus cerrosensis*, and *Lepus arizonæ confinis*.

1898. **Thomas, Oldfield.** Notes on Various American Mammals. <Ann. and Mag. Nat. Hist., ser. 7, II, pp. 318–320, October 1. The name *Lepus nuttalli* is erroneously applied to the cottontails of the eastern United States, and *Lepus nuttalli mallurus* is proposed to replace *L. sylvaticus* Bach., 1837, which latter is preoccupied by *L. borealis sylvaticus* Nilsson, 1832. *Lepus bachmani*, by examination of the type in the British Museum, is correctly identified as the Californian species commonly known as *L. trowbridgei*, thus reducing the latter name to synonymy.

1898. **Herrera, Alfonso L.** Notas Críticas acerca del *Romerolagus nelsoni*. <La Naturaleza (Mexico), ser. 2, III, Nos. 1 and 2, pp. 34–37. The author attempts to prove that the characters of *Romerolagus* are identical with those of *Lagomys*.

1899. **Allen, J. A.** Descriptions of Five New American Rodents. <Bull. Am. Mus. Nat. Hist., XII, pp. 11–17, March 4. Contains original descriptions of *Lepus bishopi*, *Lepus americanus phæonotus*, and *Lepus floridanus chapmani*.

1899. **Elliot, D. G.** Description of Apparently New Species and Subspecies of Mammals from the Indian Territory. <Field Columbian Mus. Publ., Zool. ser., I, pp. 285–288, May 24. Original description of *Lepus telmalemonus*.

1899. **Miller, Gerrit S., Jr.** A New Polar Hare from Labrador. <Proc. Biol. Soc. Washington, XIII, pp. 39–40, May 29. The original description of *Lepus labradorius*.

1899. Miller, Gerrit S., Jr. Descriptions of Six New American Rabbits. <Proc. Acad. Nat. Sci. Philadelphia, pp. 380–390, October 5. Contains original descriptions of *Lepus asellus*, *L. bachmani ubericolor*, *L. floridanus yucatanicus*, *L. floridanus subcinctus*, *L. floridanus caniclunis*, *L. floridanus sanctidiegi*.

1899. Merriam, C. Hart. Mammals of Shasta. <N. A. Fauna No 16, pp. 100–101, October 28. Contains original description of *Lepus klamathensis*.

1899. Forsyth Major, C. I. On Fossil and Recent Lagomorpha. <Trans. Linnean Soc., ser. 2, VII, Zool., pp. 433–520, with plates. A general paper, in which the author recognizes the generic rank of *Romerolagus* and discusses its relationships.

1900. Bangs, Outram. A New Jack Rabbit from Western Mexico. <New England Zoological Club, I, pp. 85–86, February 28. Original description of *Lepus alleni palitans*.

1900. Merriam, C. Hart. Descriptions of Twenty-six New Mammals from Alaska and British North America. <Proc. Washington Academy of Sciences, II, pp. 13–30. March 14. Contains original descriptions of *Lepus othus*, *L. poadromus*, *L. americanus dalli*, and *L. a. macfarlani*.

1900. Miller, Gerrit S., Jr. A New Subgenus for *Lepus idahoensis*. <Proc. Biol. Soc. Washington, XIII, p. 157, June 13. The original publication of the subgenus *Brachylagus*.

1900. Osgood, Wilfred H. Mammals of the Yukon Region. <N. A. Fauna No. 19, Biological Survey, U. S. Dept. Agr., pp. 21–45, 4 pls., October 6. Contains the original description of *Lepus saliens*.

1900. Stone, Witmer. Descriptions of a New Rabbit from the Liu Kiu Islands and a New Flying Squirrel from Borneo. <Proc. Acad. Nat. Sci. Philadelphia, 1900, pp. 460–463. Directs attention to resemblance between *Romerolagus* and *Caprolagus* Blyth, and recognizes 3 genera in the Leporidæ, viz, *Lepus*, *Caprolagus*, and *Romerolagus*.

1901. Elliot, Daniel Giraud. A Synopsis of the Mammals of North America and the Adjacent Seas. Field Col. Mus. Publ., Zool. ser., II, pp. I–XV, 1–522, with numerous plates and cuts. This is the first general work on North American mammals subsequent to the Allen and Coues monographs in 1877, and recognizes 56 species and subspecies of rabbits north of the Mexican boundary.

1901. Bangs, Outram. The Mammals Collected in San Miguel Island, Panama, by W. W. Brown, Jr. <American Naturalist, XXXV, pp. 633–635, fig. a in text, August 22. Contains original description of *Lepus* (*Tapeti*) *incitatus*.

1901. Nelson, E. W. Note on the Relationship of *Romerolagus nelsoni*, Merriam. <Sociedad Cientifica "Antonio Alzate" Revista Cientifica y Bibliográfica, Mexico, November 13. Extract from letter written to Prof. A. L. Herrera, skulls of *Lepus f. mallurus*, *Lagomys schisticeps*, and *Romerolagus nelsoni* figured.

1902. Miller, Gerrit S., Jr. A New Rabbit from Southern Texas. <Proc. Biol. Soc. Washington, XV, pp. 81–82, April 25. The original description of *Lepus simplicicanus*.

1903. Elliot, D. G. A List of a Collection of Mexican Mammals, with Descriptions of Some Apparently New Forms. <Field Columbian Mus. Publ., Zool. ser., III, pp. 141–149, March. Original description of *Lepus f. persultator*.

1903. **Allen, J. A.** List of Mammals Collected by Mr. J. H. Batty in New Mexico and Durango, with Descriptions of New Species and Subspecies. <Bull. Am. Mus. Nat. Hist., XIX, pp. 587–612, November 12. Contains original descriptions of *Lepus texianus micropus*, *Lepus gaillardi battyi*, and *Lepus durangæ*.

1903. **Elliot, D. G.** Descriptions of Twenty-seven Apparently New Species and Subspecies of Mammals. <Field Columbian Mus. Publ., Zool. ser., III, No. 14, pp. 239–261, December. Contains original descriptions of *Lepus laticinctus*, *L. laticinctus rufipes*, and *L. laticinctus perplicatus*.

1904. **Allen, J. A.** Mammals from Southern Mexico and Central and South America. <Bull. Am. Mus. Nat. Hist., XX, pp. 29–80, February 29. Contains original descriptions of *Lepus russatus* and *Lepus parvulus*.

1904. **Nelson, E. W.** Descriptions of Seven New Rabbits from Mexico. <Proc. Biol. Soc. Washington, XVII, pp. 103–110, May 18. Contains the original descriptions of *Lepus insonus*, *Lepus veræcrucis pacificus*, *Lepus floridanus connectens*, *Lepus floridanus chiapensis*, *Lepus arizonæ goldmani*, *Lepus festinus*, *Lepus merriami altamiræ*.

1904. **Lyon, Marcus Ward, Jr.** Classification of the Hares and Their Allies. <Smithsonian Miscellaneous Collections (Quarterly Issue), XLV, No. 1456, pp. 321–447, with plates, June 15. This excellent paper includes a comprehensive account of the genera and subgenera of the North American rabbits with plates and descriptions of their osteological characters. Five genera and three additional subgenera from North America are recognized, one of which, *Pœcilolagus*, is first described here, and *Brachylagus* is raised from subgeneric to generic rank. These groups are as follows: 1. Genus *Lepus*, including the subgenera *Lepus*, *Macrotolagus*, and *Pœcilolagus;* 2. Genus *Sylvilagus*, including the subgenera *Sylvilagus* and *Microlagus;* and the genera, 3, *Limnolagus;* 4. *Brachylagus;* 5. *Romerolagus*.

1904. **Merriam, C. Hart.** Jack Rabbits of the *Lepus campestris* group. <Proc. Biol. Soc. Washington, XVII, pp. 131–133, July 14. A revision of this group in which *L. townsendi* is reinstated as distinct from *campestris* and a new subspecies, *L. c. sierræ*, is described.

1904. **Merriam, C. Hart.** Unrecognized Jack Rabbits of the *Lepus texianus* group. <Proc. Biol. Soc. Washington, XVII, pp. 135–138, July 14. Original descriptions of *Lepus tularensis* and *Lepus texianus wallawalla*. The name *Lepus richardsoni* Bachman is revived for certain jack rabbits about the borders of the San Joaquin Valley, California.

1904. **Elliot, Daniel Giraud.** The Land and Sea Mammals of Middle America and the West Indies. Field Col. Mus. Publ., Zool. ser., IV, pt. 1, pp. i–xxi, 1–439, i–xlix, with numerous plates and cuts. This work recognized 44 species and subspecies of rabbits in the region between Panama and the southern border of the United States, 25 of which are additional to the 56 recognized by the same author from the region north of Mexico in his Synopsis of the Mammals of North America, thus making a total of 81 species and subspecies of rabbits between Panama and the Arctic regions.

1905. **Bailey, Vernon.** Biological Survey of Texas. <North American Fauna No. 25, pp. 151–161, October 24. Contains original description of *Lepus robustus* and extended notes on distribution and habits of 10 species and subspecies of rabbits in Texas.

1907. Osgood, Wilfred H. Some Unrecognized and Misapplied Names of American Mammals. <Proc. Biol. Soc. Washington, XX, pp. 43–52, April 18. *Lepus cunicularius* Waterhouse, by examination of the type, proved to be the same as *L. verœcrucis* Thomas, which it antedates.

1907. Nelson, E. W. Descriptions of New American Rabbits. <Proc. Biol. Soc. Washington, XX, pp. 81–84, July 22. Contains original descriptions of *Lepus californicus magdalenœ*, *Sylvilagus cognatus*, *S. floridanus similis*, *S. floridanus restrictus*, *S. auduboni vallicola*, *S. auduboni cedrophilus*, *S. auduboni neomexicanus*, *S. auduboni warreni*, *Sylvilagus mansuetus*, *S. bachmani exiguus*.

1907. Nelson, E. W. Descriptions of two New Subspecies of North American Mammals. <Proc. Biol. Soc. Washington, XX, p. 87, December 11. Contains the original description of *Lepus bairdi cascadensis*.

1908. Lantz, D. E. The Rabbit as a Farm and Orchard Pest. Yearbook U. S. Department of Agriculture for 1907, pp. 329–342, published July 27, 1908. A general account of the relations of rabbits to agriculture in the United States based on data gathered by the Biological Survey. Reprinted and issued as a separate.

1908. Allen, Dr. J. A. Mammals from Nicaragua. <Bull. Am. Mus. Nat. Hist., N. Y., XXIV, pp. 647–670, October 13, 1908. Contains original description of *Lepus gabbi tumacus* [= *Sylvilagus gabbi*] and the first record of *Sylvilagus floridanus chiapensis* from Nicaragua.

1908. Preble, E. A. A Biological Investigation of the Athabaska-Mackenzie Region. North American Fauna No. 27, pp. 199–208, October 28. Contains good accounts of the distribution and habits of the Varying and Arctic hares with a specially valuable contribution to the life history of *L. a. americanus*.

1908. Fleming, J. H. The Cottontail Rabbit in Ontario. < The Ottawa Naturalist, XXII, pp. 158, 159 (map), November 2. Gives notes on recent extensions of range.

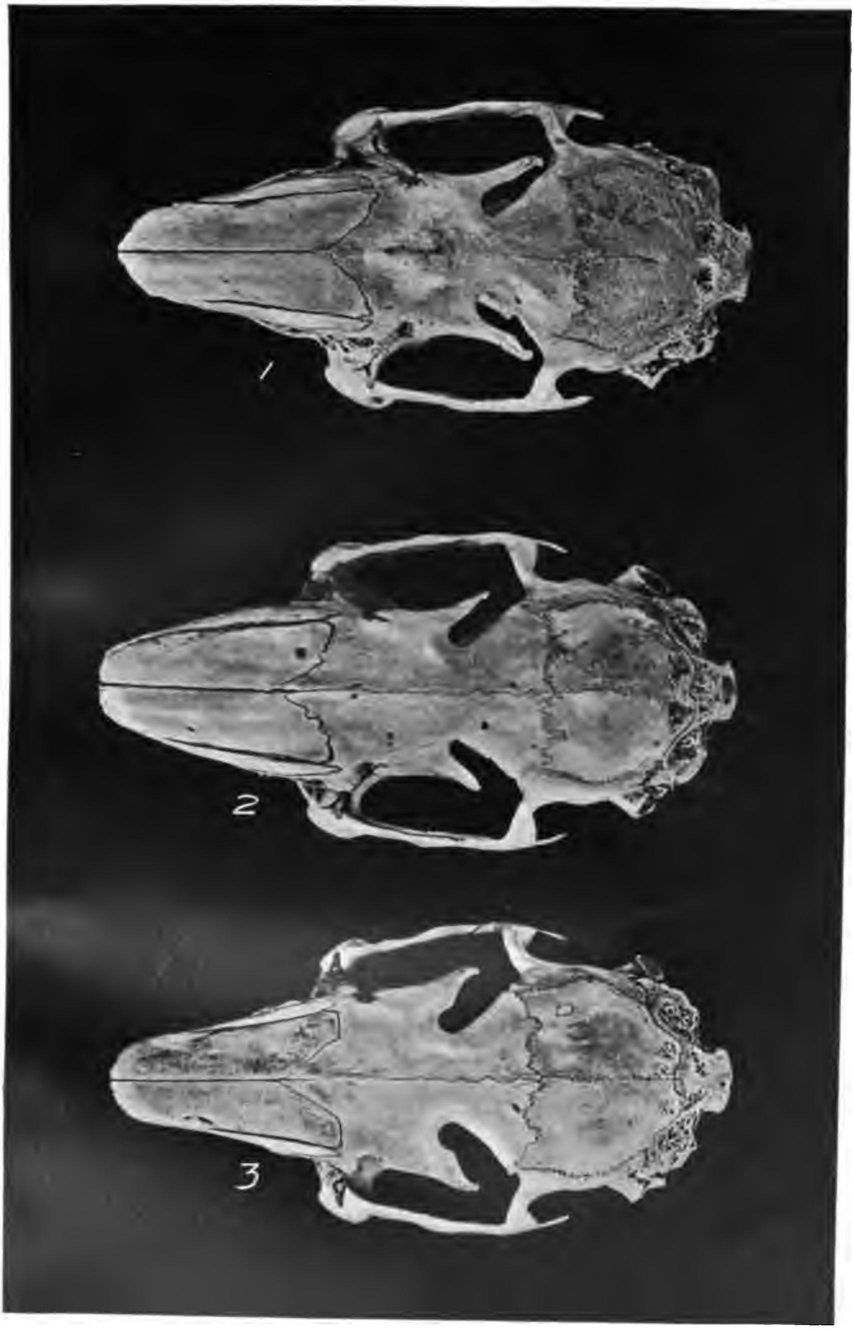
PLATE II.

(Natural size.)

FIG. 1. *Lepus americanus virginianus* Harlan. ♀ ad. Gold, Pennsylvania. (No. 898, Carnegie Mus.)

2. *Lepus americanus virginianus* Harlan. ♂ ad. Gold, Pennsylvania. (No. 899, Carnegie Mus.)

3. *Lepus americanus virginianus* Harlan. ♂ ad. Gold, Pennsylvania. (No. 900, Carnegie Mus.)

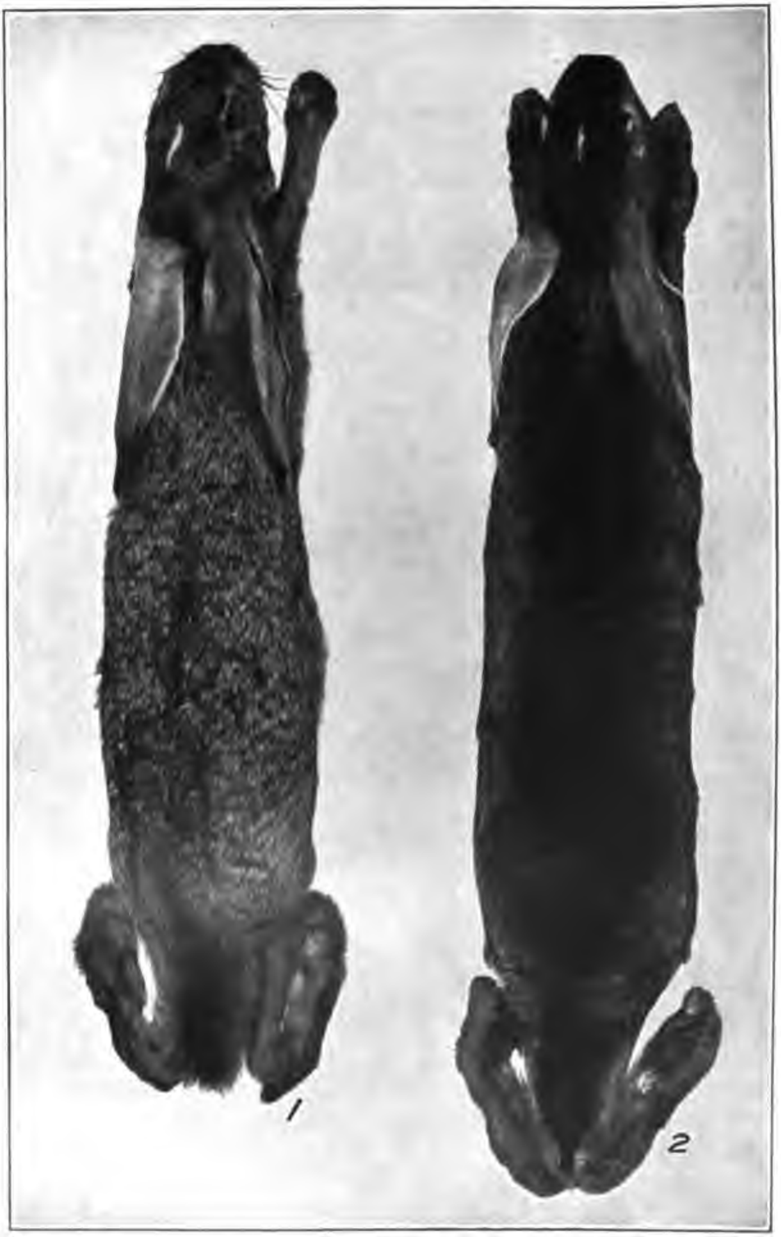


1, 2, 3. SKULLS OF LEPUS AMERICANUS VIRGINIANUS SHOWING INDIVIDUAL VARIATION.

PLATE III.

FIG. 1. *Lepus californicus xanti* Thomas. ♂ ad. Cape St. Lucas, Lower California, Mexico. (No. 146579. U. S. Nat. Mus., Biological Survey Coll.)

2. *Lepus insularis* Bryant. ♂ ad. Espiritu Santo Island, Lower California, Mexico. (No. 147061, U. S. Nat. Mus., Biological Survey Coll.)



1. SKIN OF LEPUS CALIFORNICUS XANTI; 2. L. INSULARIS.

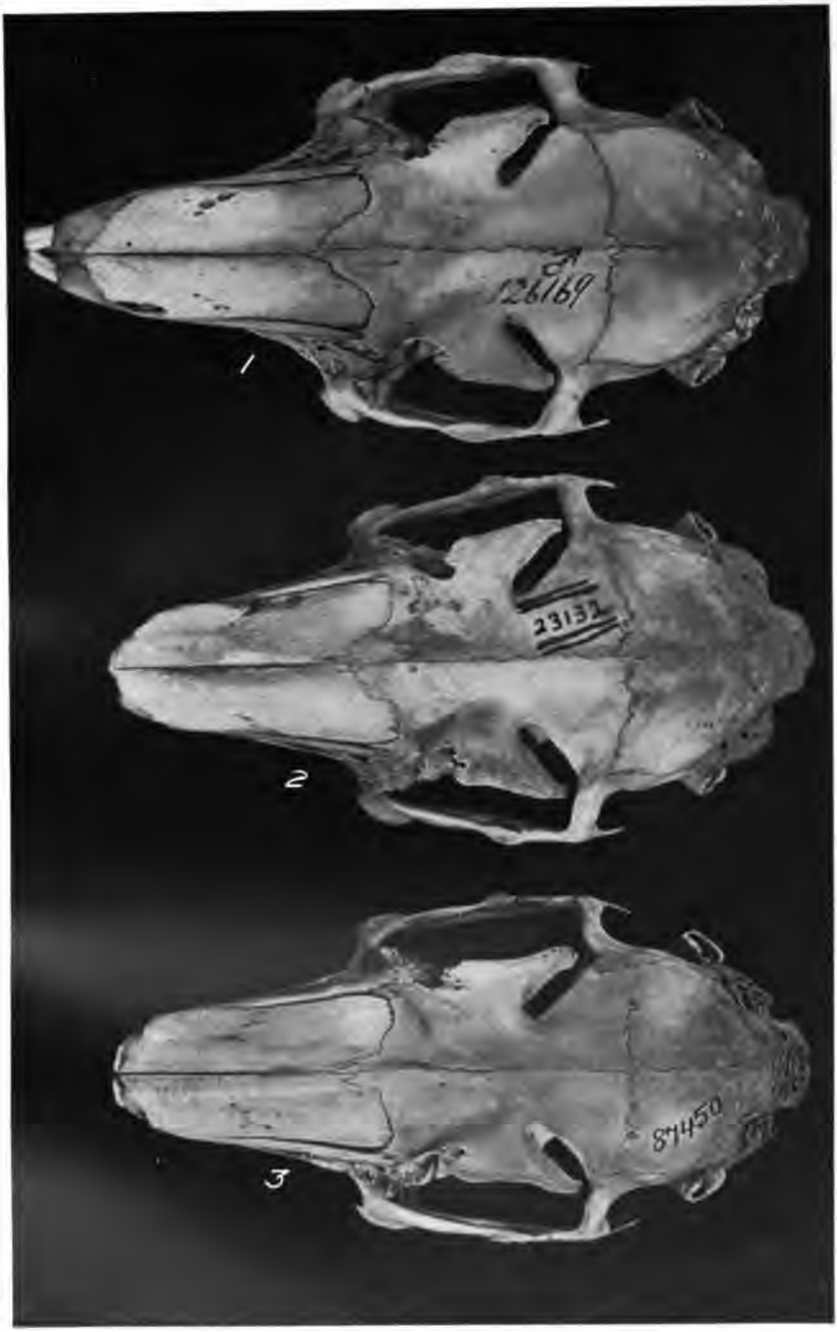
PLATE IV.

(Natural size.)

FIG. 1. *Lepus grœnlandicus* Rhoads. ♂ ad. Ellesmere Land, April 24, 1901. (No. 126169, U. S. Nat. Mus.)

2. *Lepus arcticus* Ross. Ad. Fort Chimo, Ungava, Canada. (No. 23132, U. S. Nat. Mus.; type of *L. a. labradorius* Miller.)

3. *Lepus campestris* Bachm. Ad. Fort Meade, North Dakota, June 1, 1894. (No. 87450, U. S. Nat. Mus., Biological Survey Coll.)



SKULLS OF LEPUS (SUBGENUS LEPUS).

1. L. grœnlandicus; 2. L. arcticus; 3. L. campestris.

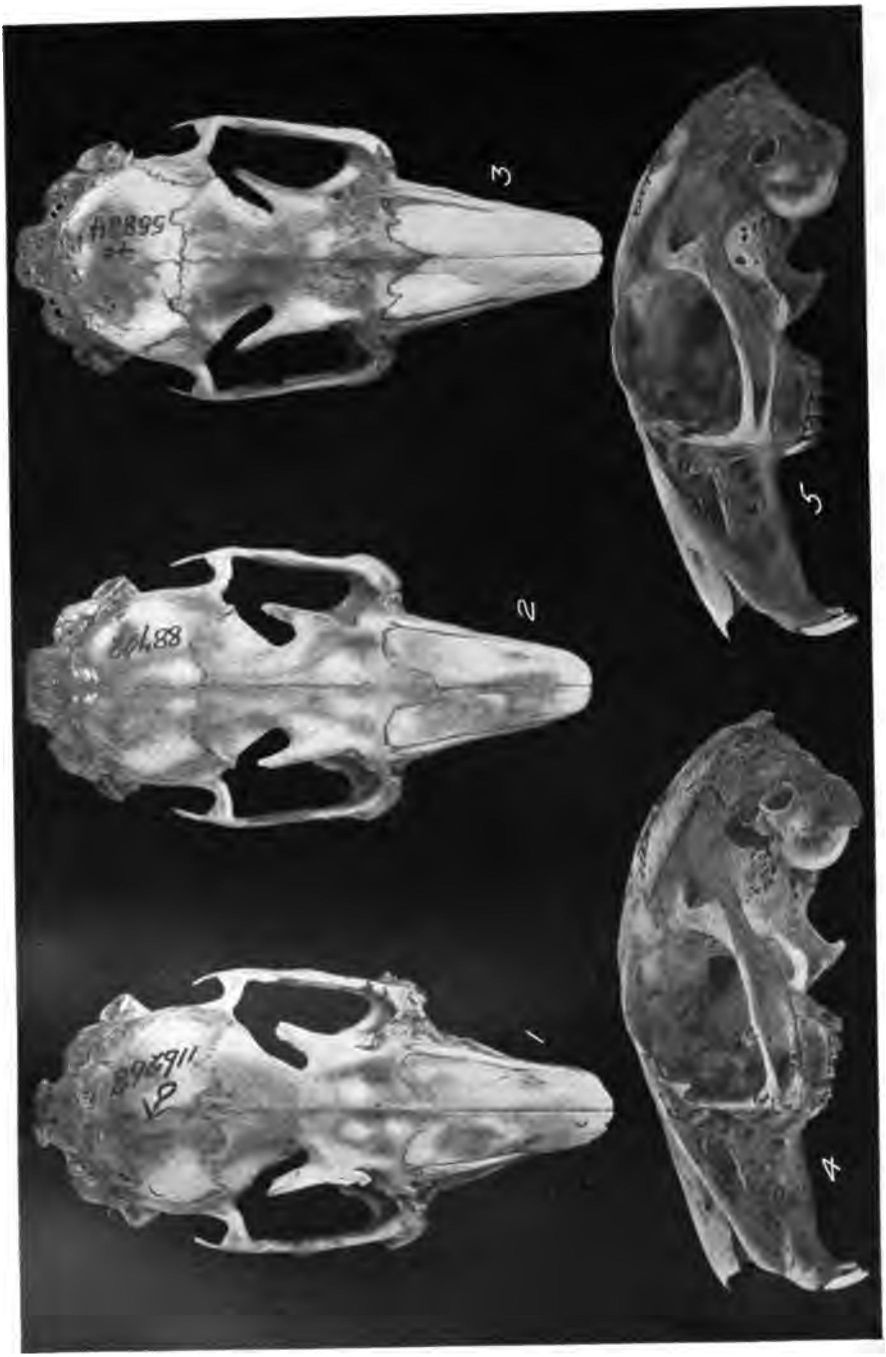
PLATE VI.

(Natural size.)

FIGS. 1, 4. *Lepus americanus* Erxleben. ♂ ad. Fort Chipewyan, Alberta, Canada, May 29, 1901. (No. 116268, U. S. Nat. Mus., Biological Survey Coll.)

2, 5. *Lepus washingtoni* Baird. Ad. Neah Bay, Washington, May 29, 1897. (No. 88722, U. S. Nat. Mus., Biological Survey Coll.)

3. *Lepus bairdi* Hayden. ♀ ad. Lake Fork, Wyoming, August 23, 1893. (No. 55834, U. S. Nat. Mus., Biological Survey Coll.)



SKULLS OF LEPUS (SUBGENUS LEPUS).

1, 4. L. americanus; 2, 5. L. washingtoni; 3. L. bairdi.

PLATE VII.

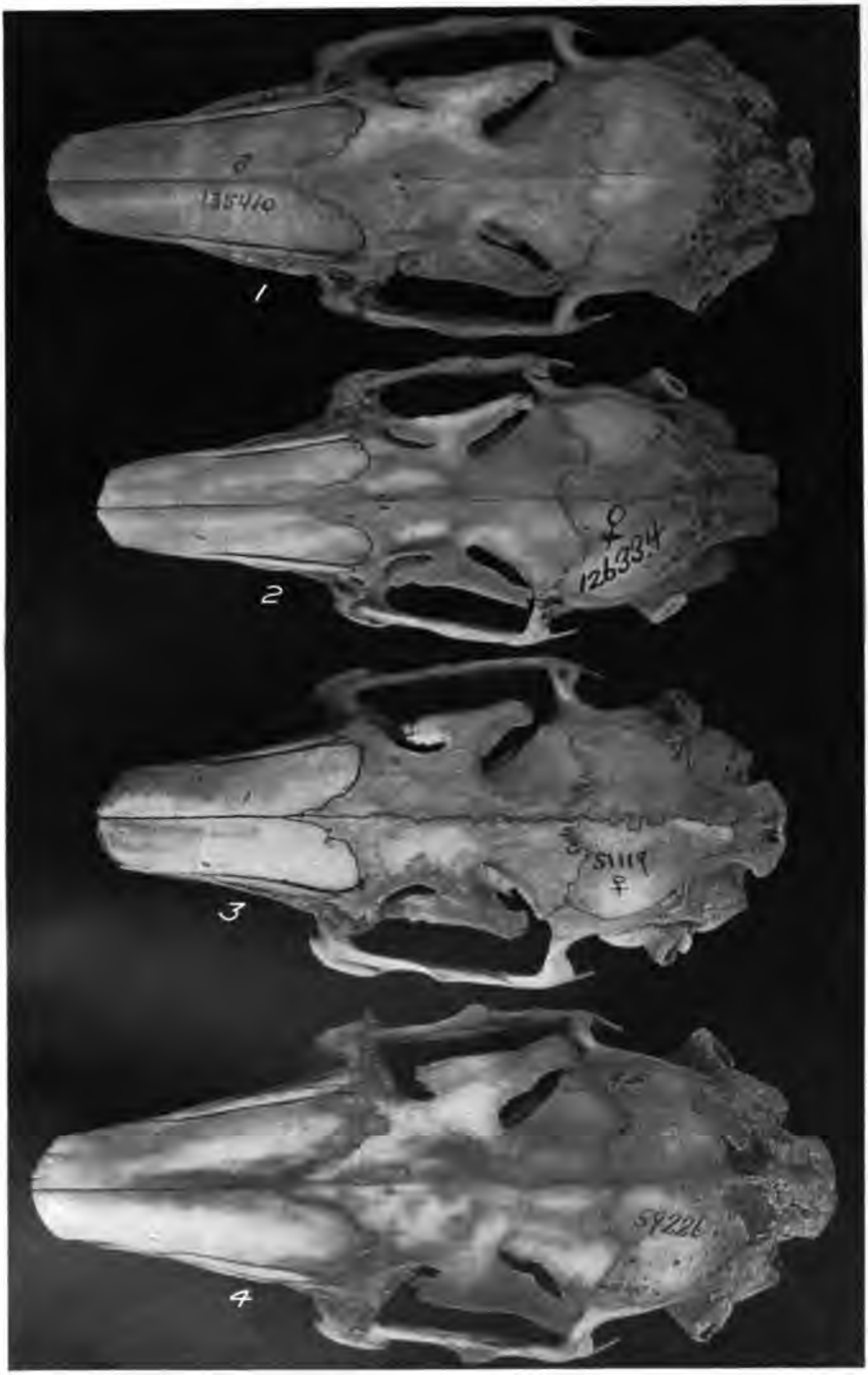
(Natural size.)

FIG. 1. *Lepus californicus* Gray. ♂ ad. Marysville Buttes, California, December 18, 1904. (No. 135410, U. S. Nat. Mus., Biological Survey Coll.)

2. *Lepus californicus richardsoni* Bachman. ♀ ad. Alila, California, October 25, 1900. (No. 126334, U. S. Nat. Mus., Biological Survey Coll.)

3. *Lepus callotis* Wagler. ♀ ad. Cuernavaca, Morelos, Mexico, January 9, 1893. (No. 51119, U. S. Nat. Mus., Biological Survey Coll.)

4. *Lepus alleni* Mearns. Ad. La Osa, Pima County, Arizona, December 26, 1893. (No. 59226, U. S. Nat. Mus.)



SKULLS OF LEPUS (SUBGENUS MACROTOLAGUS).

1. L. californicus; 2. L. c. richardsoni; 3. L. callotis; 4. L. alleni.

PLATE VIII.

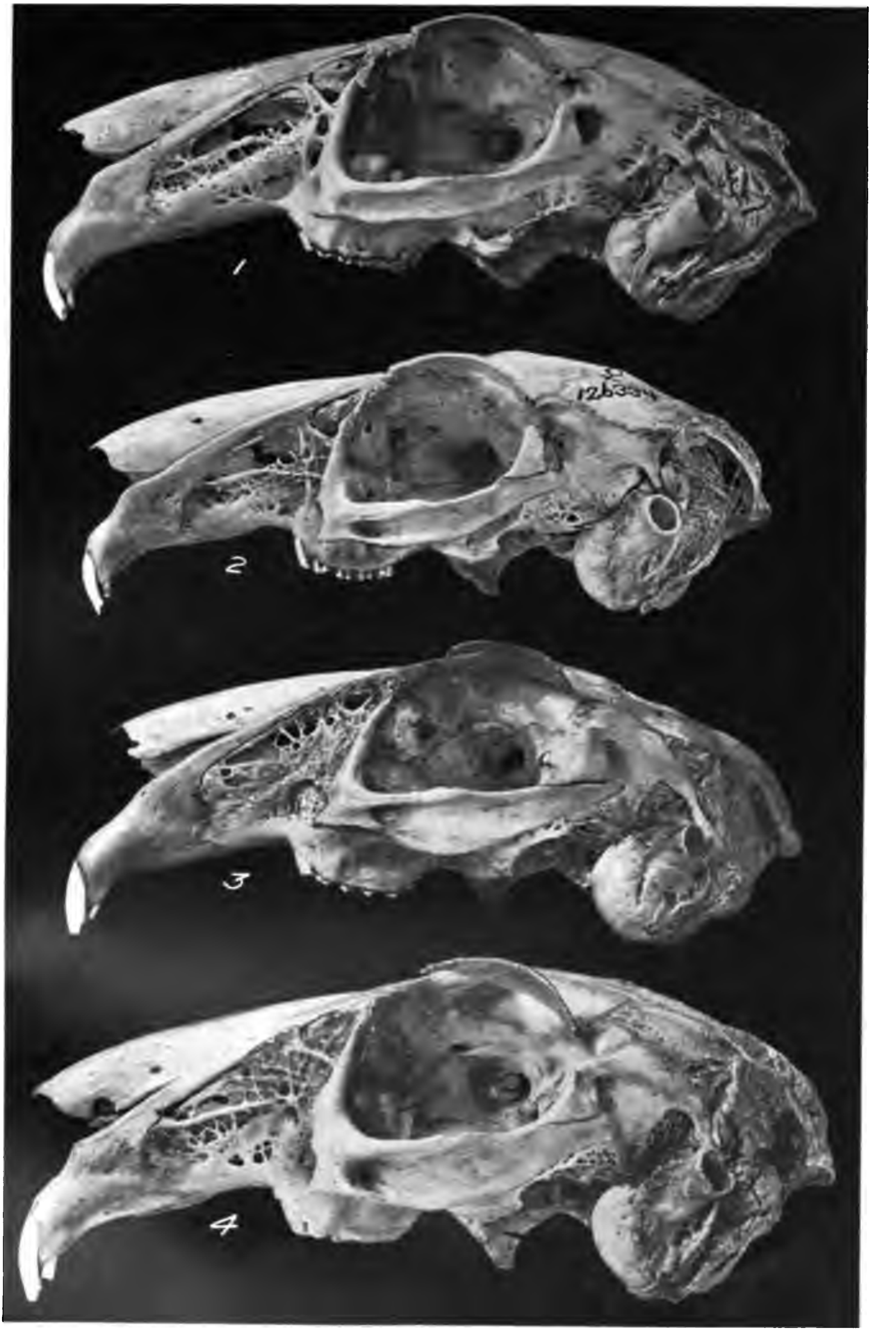
(Natural size.)

FIG. 1. *Lepus californicus* Gray. ♂ ad. Marysville Buttes, California, December 18, 1904. (No. 135410, U. S. Nat. Mus., Biological Survey Coll.)

2. *Lepus californicus richardsoni* Bachman. ♀ ad. Alila, California, October 25, 1900. (No. 126334, U. S. Nat. Mus., Biological Survey Coll.)

3. *Lepus callotis* Wagler. ♀ ad. Cuernavaca, Morelos, Mexico, January 9, 1893. (No. 51119, U. S. Nat. Mus., Biological Survey Coll.)

4. *Lepus alleni* Mearns. Ad. La Osa, Pima County, Arizona, December 26, 1893. (No. 59226, U. S. Nat. Mus.)



SKULLS OF LEPUS (SUBGENUS MACROTOLAGUS).

1. Lepus californicus; 2. L. c. richardsoni; 3. L. callotis; 4. L. alleni.

PLATE IX.

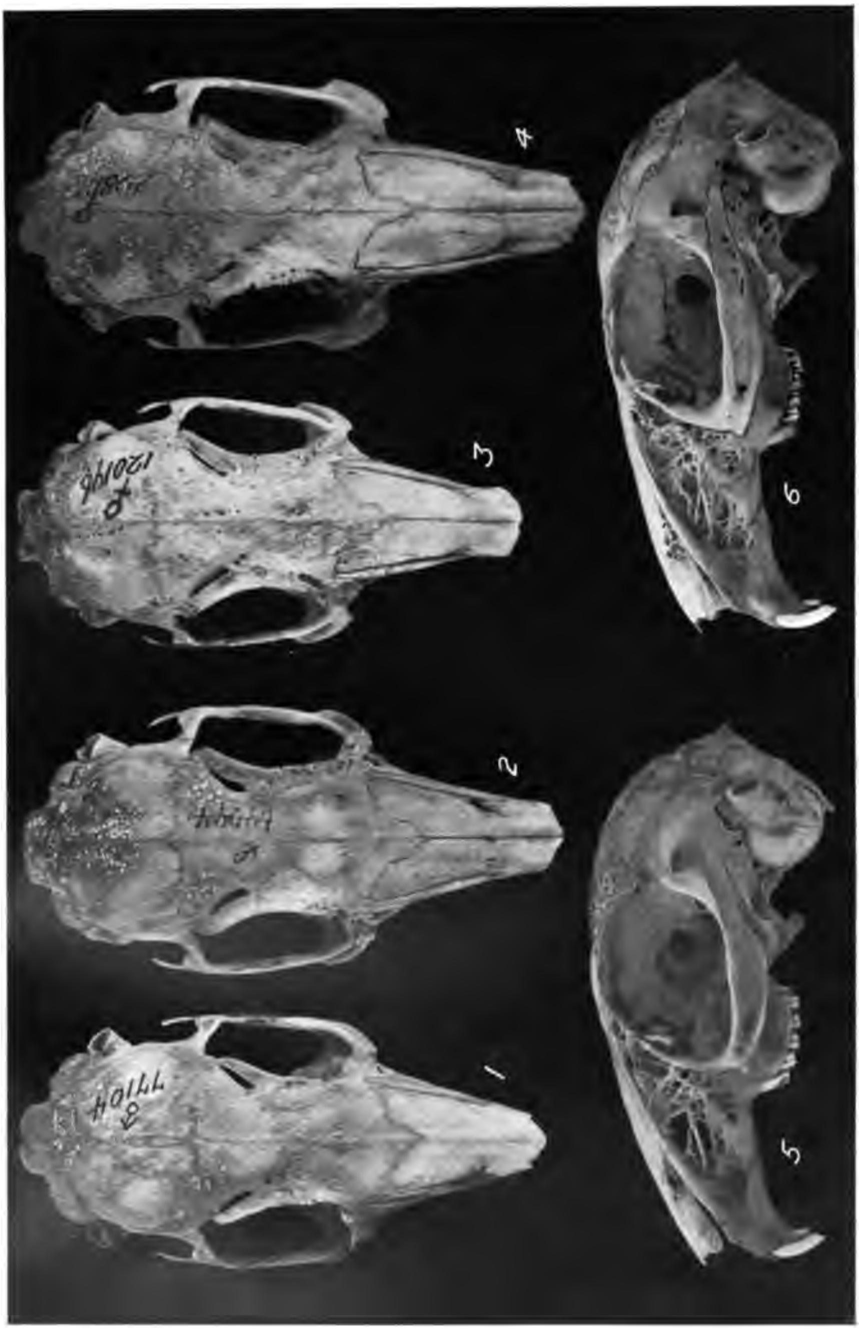
(Natural size.)

FIG. 1. *Sylvilagus transitionalis* Bangs. ♂ ad. Wilmington, Massachusetts. March 23, 1896. (No. 77104, U. S. Nat. Mus., Biological Survey Coll.)

2, 5. *S. floridanus* Allen. ♀ ad. Fort Kissimmee, Florida, February 19 1894. (No. 64044, U. S. Nat. Mus., Biological Survey Coll.)

3. *S. floridanus chapmani* Allen. ♀ ad. Corpus Christi, Texas, August 21, 1902. (No. 120196, U. S. Nat. Mus., Biological Survey Coll.)

4, 6. *S. floridanus yucatanicus* Miller. ♀ ad. Progreso, Yucatan, Mexico. February 24, 1901. (No. 108185, U. S. Nat. Mus., Biological Survey Coll.)



SKULLS OF SYLVILAGUS (SUBGENUS SYLVILAGUS).

1. S. transitionalis; 2, 5. S. floridanus; 3. S. f. chapmani; 4, 6. S. f. yucatanicus.

PLATE X.

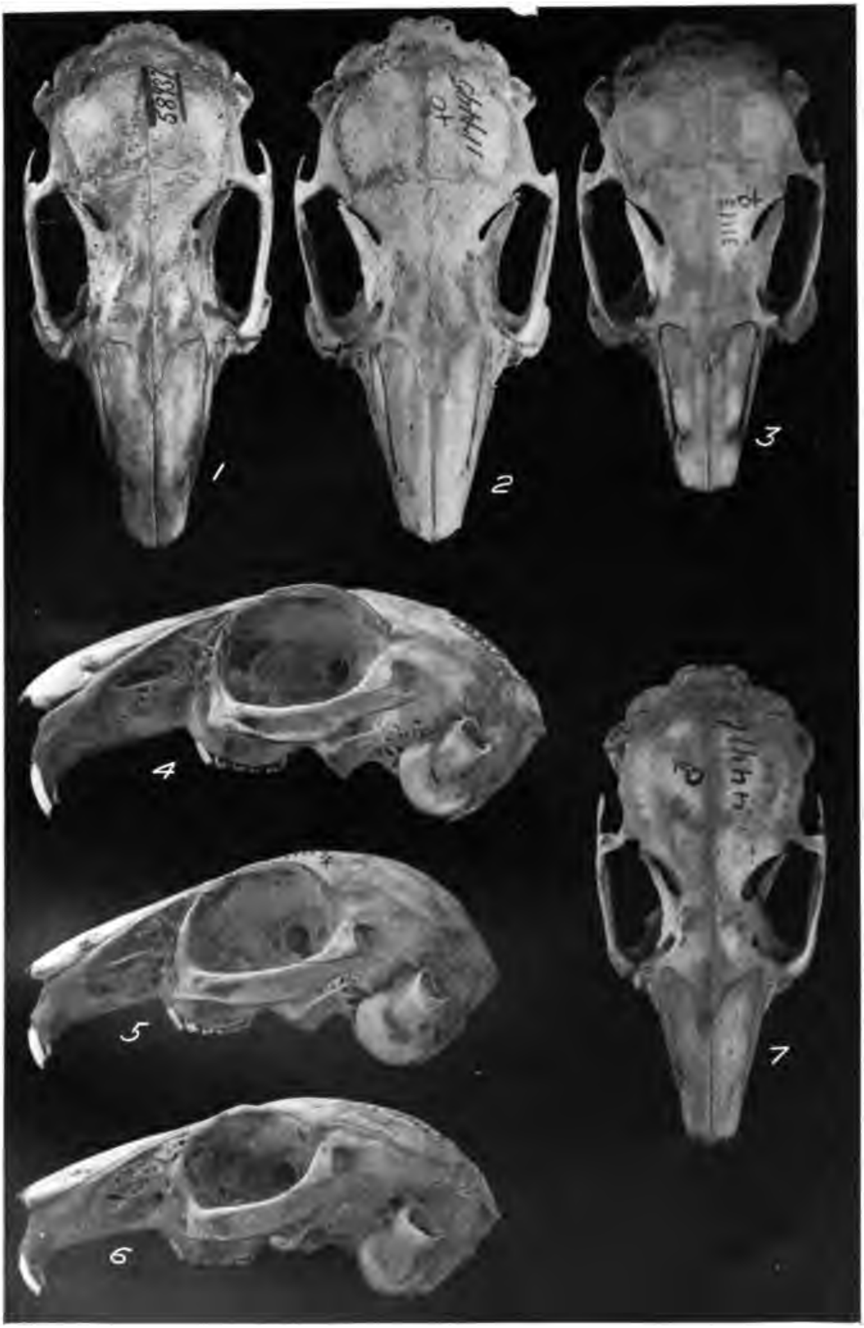
(Natural size.)

FIGS. 1, 4. *Sylvilagus floridanus holzneri* Mearns. Ad. Huachuca Mountains Arizona. (No. 58937, U. S. Nat. Mus.; type.)

2. *S. nuttalli pinetis* Allen. ♀ ad. Hualpai Mountains, Arizona, July 7, 1902. (No. 117495, U. S. Nat. Mus., Biological Survey Coll.)

3, 5. *S. nuttalli* Bachm. ♀ ad. Touchet, Washington, September 11, 1890. (No. 31113, U. S. Nat. Mus., Biological Survey Coll.)

6, 7. *S. bachmani* Waterhouse. San Luis Obispo, California, January 22, 1892. (No. 44416, U. S. Nat. Mus., Biological Survey Coll.)



SKULLS OF SYLVILAGUS (SUBGENUS SYLVILAGUS).

1, 4. S. floridanus holzneri; 2. S. nuttalli pinetis; 3, 5. S. nuttalli; 6, 7. S. bachmani.

PLATE XI.

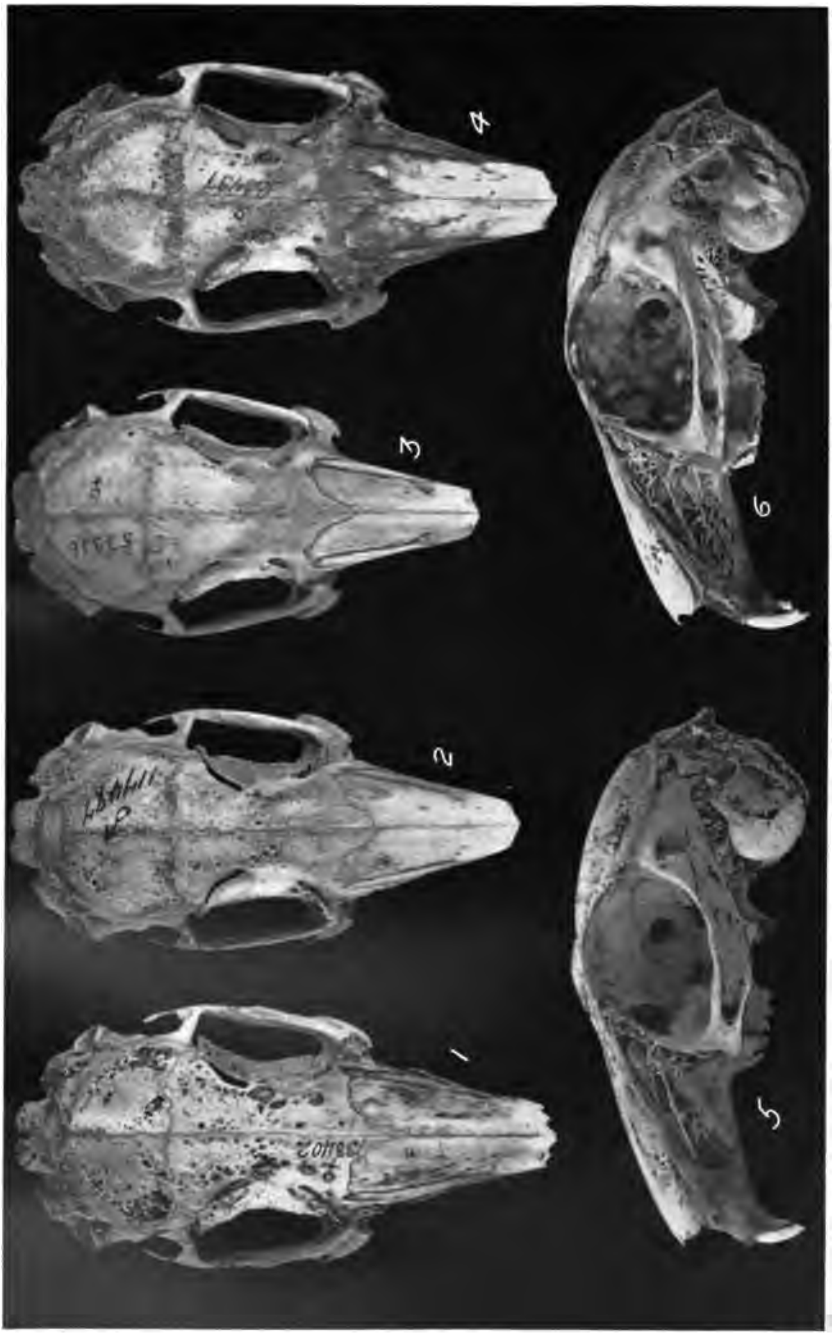
(Natural size.)

FIGS. 1, 5. *Sylvilagus auduboni* Baird. ♀ ad. Chico, California, August 1904. (No. 133402, U. S. Nat. Mus., Biological Survey Coll.)

2. *S. auduboni arizonæ* Allen. ♂ ad. Beals Spring, Arizona, July 1902. (No. 117487, U. S. Nat. Mus., Biological Survey Coll.)

3. *S. auduboni parvulus* Allen. ♀ ad. Irolo, Hidalgo, Mexico, Apr 4, 1893. (No. 53316, U. S. Nat. Mus., Biological Survey Coll.)

4, 6. *S. auduboni baileyi* Merriam. ♀ ad. Wamsutter, Wyoming, Ju 31, 1907. (No. 150437, U. S. Nat. Mus., Biological Survey Coll.)



SKULLS OF SYLVILAGUS (SUBGENUS SYLVILAGUS).

1, 5. S. auduboni; 2. S. a. arizonæ; 3. S. a. parvulus; 4, 6. S. a. baileyi.

PLATE XII.

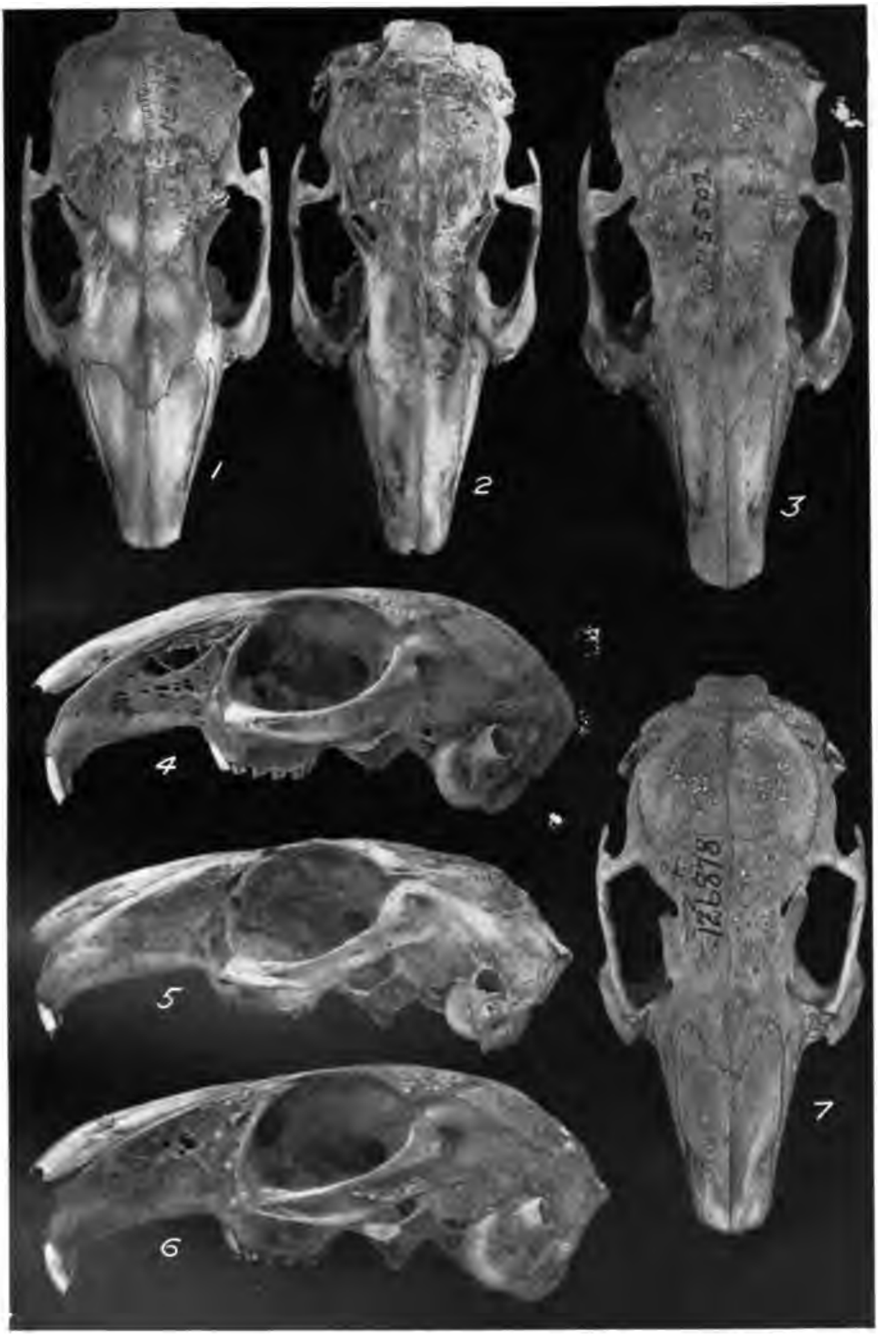
(Natural size.)

FIGS. 1, 4. ***Sylvilagus minensis*** Thomas. Ad. Chapada, Matto Grosso, Brazil. May, 1883. (No. 113,432, U. S. Nat. Mus.)

2, 5. *S.* ***gabbi*** Allen. Ad. Talamanca, Costa Rica. (No. $\frac{37794}{11371}$, U. S. Nat. Mus.; type.)

3, 6. *S.* ***palustris*** Bachm. ♀ ad. Riceboro, Georgia, April 8, 1892. (No. 45502, U. S. Nat. Mus., Biological Survey Coll.)

7. *S.* ***insonus*** Nelson. ♀ ad. Omilteme, Guerrero, Mexico, May 20 1903. (No. 126878, U. S. Nat. Mus., Biological Survey Coll.; type.)



SKULLS OF SYLVILAGUS (SUBGENUS TAPETI).

1, 4. S. minensis; 2, 5. S. gabbi; 3, 6. S. palustris; 7. S. insonus.

PLATE XIII.

(Natural size.)

Figs. 1, 2, 3. *Romerolagus nelsoni* Merriam. ♂ ad. Mount Popocatepet
Mexico, January 6, 1894. (No. 57952, U. S. Nat. Mus., Biolo
ical Survey Coll.)

4, 5, 6. *Brachylagus idahoensis* Merriam. ♀ ad. Halleck, Nevada, Ju
30, 1893. (No. 54511, U. S. Nat. Mus., Biological Survey Coll.

7, 8. *Sylvilagus cunicularius* (Waterhouse). ♂ ad. Las Vigas, Ver
Cruz, Mexico, June 9, 1893. (No. 54208, U. S. Nat. Mus., Bi
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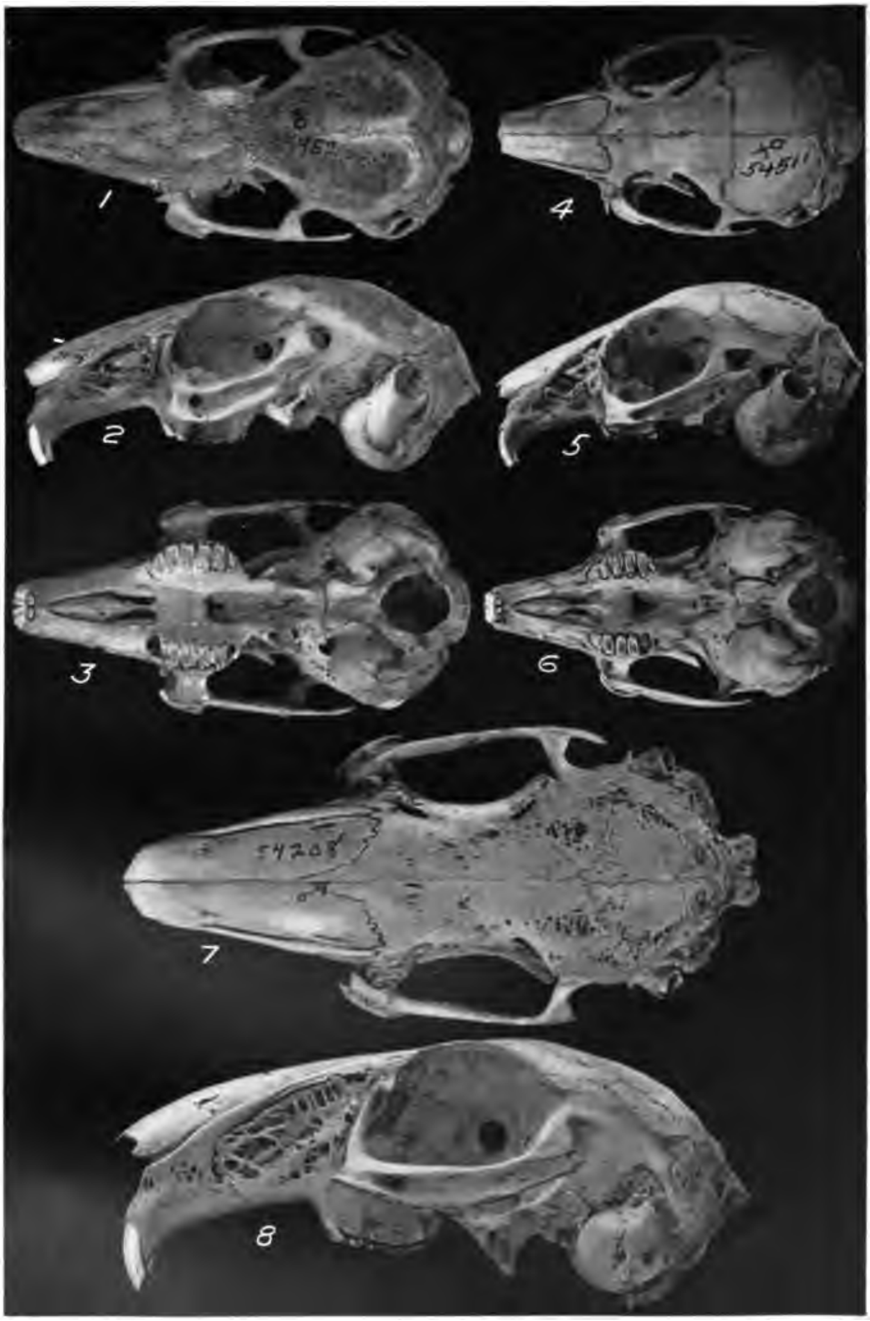

SKULLS OF ROMEROLAGUS, BRACHYLAGUS, AND SYLVILAGUS.

1, 2, 3. Romerolagus nelsoni; 4, 5, 6. Brachylagus idahoensis; 7, 8. Sylvilagus cunicularius.

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[New names in **bold-face** type; synonyms in *italics*.]

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